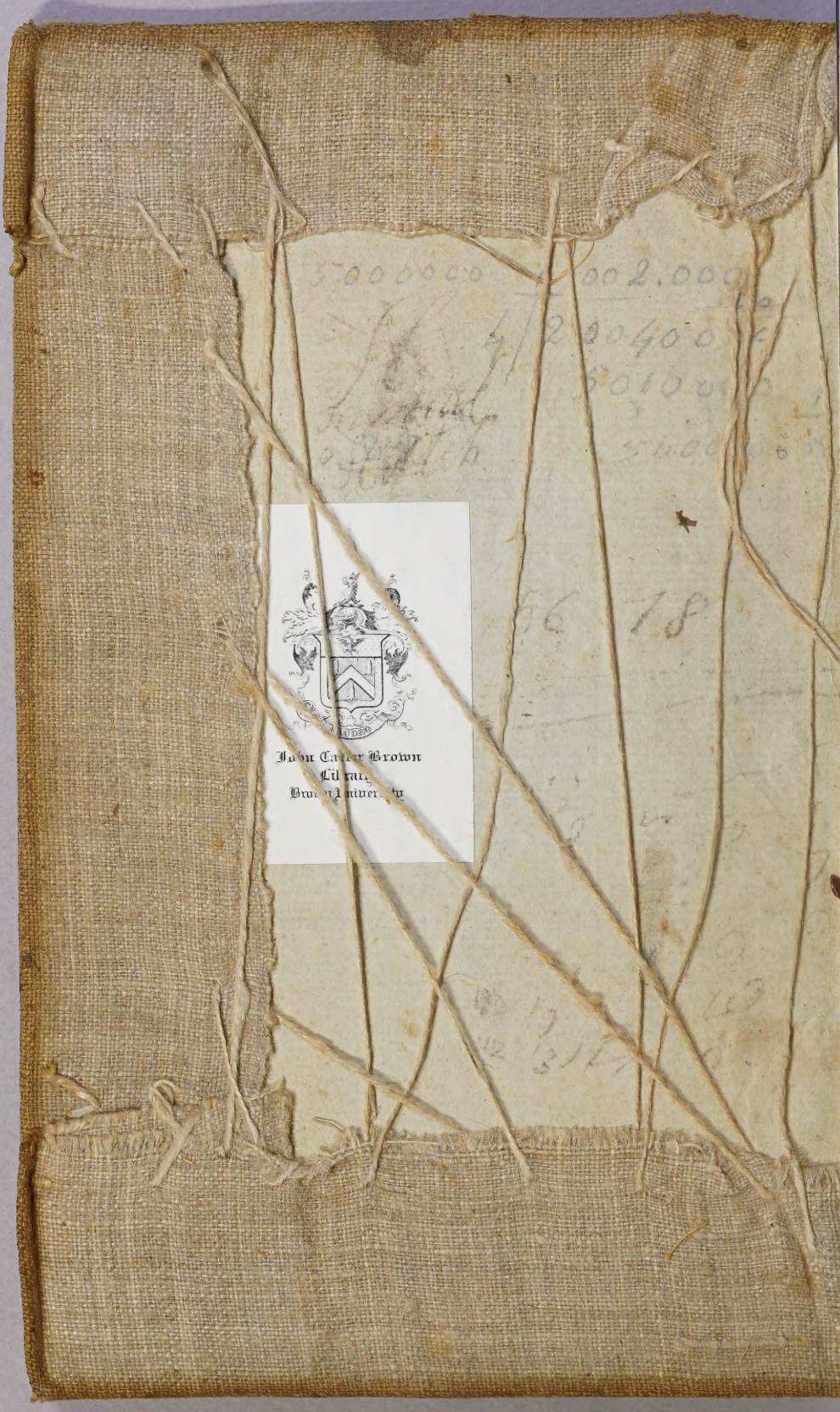
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Moses Curtis his Book

Wrote July the 13th 1800

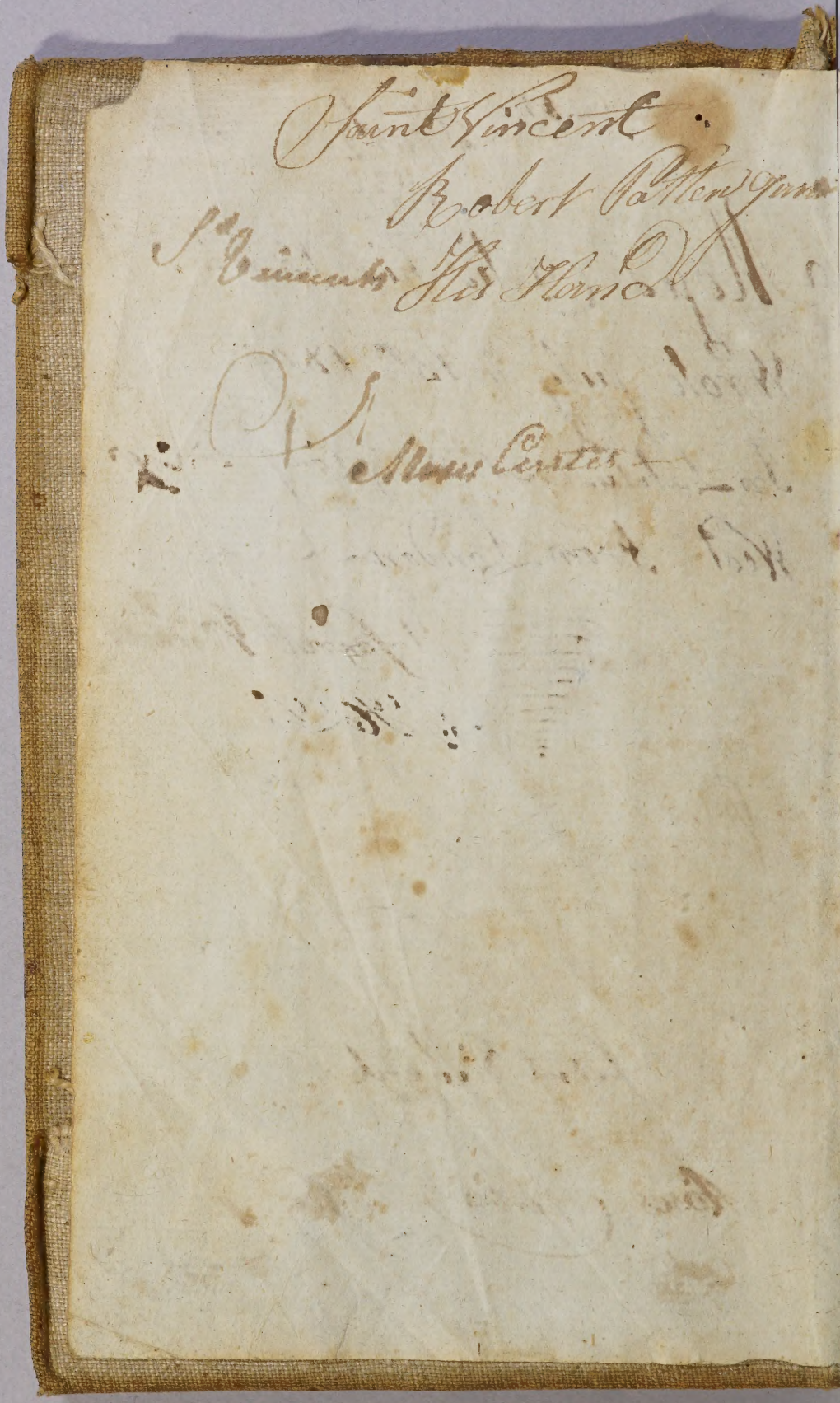
In Latitude 31..55 & Long.. 53.40

West from London

Saint Vincent

Saint Vincent

Moses Curtis



THE

SEAMAN's COMPLETE DAILY ASSISTANT,

AND

NEW MARINER's COMPASS:

BEING AN EASY METHOD OF

Keeping a Journal at Sea.

CONTAINING

Rules for working the Cafes in Plane, Middle Latitude, and Mercator's Sailing, by the Tables of Difference of Latitude and Departure. The Method to find the Latitude, Longitude, and Variation of the Compafs; how Allowances are to be made for Leeway, Variation, Heave of the Sea, Setting of the currents, and to Correct the Dead Reckoning by an Obfervation for a fingle Day or many; with all the Tables requifite to be ufed at Sea.

THE WHOLE EXEMPLIFIED IN

A JOURNAL FROM THE LIZARD TO THE ISLAND OF ST. MARY,

And every Day's Work pricked off upon a Mercator's Chart.

TO WHICH IS PREFIXED

A SHORT AND EASY

TREATISE ON ARITHMETIC:

CONTAINING

The neceffary Rules of common Arithmetic, Decimal Fractions, the Extraction of the Square and Cube Roots, with their Ufe in meafuring all Kinds of Boards, Planks, Cafes, Cafks, Bales, and Packages ufually taken on Board. The Gauging of Cafks, and finding a Ship's Tonnage, worked by Figures, Gunter's Scale and Logarithms. Likewife the Methods of keeping a Ship's Accounts, Difburfements, the Forms of Cargo-Books, Receipts for Wages, Invoice and Manifeft of Goods, Bills of Parcels, and Letters of Credit.

The whole rendered fo plain, that any Perfon may gain a fufficient Knowledge of the above by their own Application, without any other Affiftance.

TO THIS EDITION IS ADDED,

The Ufe of Hadley's Quadrant, and Mercator's Chart,

WITH MANY VALUABLE IMPROVEMENTS.

By JOHN HAMILTON MOORE,

TEACHER OF NAVIGATION, HYDROGRAPHER AND CHART-SELLER TO HIS ROYAL HIGHNESS THE DUKE OF CLARENCE.

THE FIFTH EDITION.

LONDON:

PRINTED FOR AND SOLD BY B. LAW, IN STATIONERS COURT; G. G. AND J. ROBINSON, PATERNOSTER-ROW; LAURIE AND WHITTLE, FLEET-STREET, AND THE AUTHOR ON TOWER-HILL. 1796.

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RPJCB

TO

MARINERS IN GENERAL.

IT is well known that many young Men go to Sea at ſuch an early Period, as to preclude their having a ſufficient Knowledge of Arithmetic or Navigation, and after they have gained a tolerable Share of practical Seamanſhip, would gladly acquire by their own Application the Method of keeping a Ship's Way at Sea; without ſtudying much of the Theory, which their Time and Application to the Duty of the Ship renders out of their Power.

For the Uſe of ſuch, as well as to be convenient for the Pocket and the Quarter Deck, I have compiled this little Book, which from its Simplicity cannot fail of being underſtood, and enabling the Mariner to direct a Ship to any Part of the World; as it contains every Thing neceſſary for working a Day's Work at Sea, with all the Tables requiſite numbered for the more readily finding them. The Tables of the Latitudes and Longitudes of Places is new, and more correct than any publiſhed.

As a Knowledge of Arithmetic is abſolutely neceſſary in Navigation, I have begun with that, and laid down the Rules in ſuch a Manner, and explained them ſo fully, that any Perſon of common Capacity, by his

own Application, can hardly fail of acquiring a ſufficient Knowledge of it. Meaſuring and finding the Contents of Bales and Packages, uſually taken on Board Ships, is treated of in a Manner entirely new, and I hope will be found eaſy and uſeful to thoſe employed in Shipping: Likewiſe Plans of Cargo-Books, and the Method of keeping Ships Accounts of Diſburſements, Goods, &c.

Plane, Middle Latitude, and Mercator's Sailing, worked by the Tables of Difference of Latitude and Departure follows; and then the Rules for keeping a Reckoning at Sea, exemplified in a Journal from England to St. Mary's, in which are ſhewn all the Rules for Variation, Heave of the Sea, laying to, and to correct the dead Reckoning by an Obſervation, with moſt of the Occurrences that commonly happen at Sea, and the Ship's Way pricked off on a Mercator's Chart. Alſo to this Edition are added the Uſe of Hadley's Quadrant, Mercator's Chart, and a new Tide Table. The foregoing being the Outlines of my Plan, I ſhall refer the Reader to the Contents, and ſhould the Execution merit his Approbation, it will be a pleaſing Satisfaction to

His devoted

And very humble Servant,

JOHN HAMILTON MOORE.

Tower-Hill, Sept. 1, 1796.

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Alſo a General Rule for diſtinguiſhing the Stars.

A

SHORT AND EASY INTRODUCTION

TO

ARITHMETIC.

BY WHICH

ANY ONE MAY GAIN A SUFFICIENT KNOWLEDGE OF FIGURES BY THEIR OWN APPLICATION.

ARITHMETIC teaches the Properties of Numbers, and how to compute or eſtimate the value of things, and hath theſe five parts, viz. Numeration, Addition, Subtraction, Multiplication and Diviſion, which ſhould be thoroughly underſtood; for, by theſe rules only the art is attainable; and as no progreſs can be made in the art of Navigation without ſome knowledge of Arithmetic, we ſhall begin with

NUMERATION.

Numeration is that part of Arithmetic whereby one may rightly expreſs the value of any number propoſed.

All numbers are expreſſed by the following characters:

1	2	3	4	5	6	7	8	9	0
One	two	three	four	five	ſix	ſeven	eight	nine	nought.

Although ciphers, commonly called noughts, ſignify by themſelves nothing, yet being put to the right hand of other figures, they increaſe the value of the preceding figures as much as if they were all figures, as may be plainly ſeen in the following Table.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	Tens of Thouſands	10000
123456	Hundreds of Thouſands	100000
1234567	Millions	1000000
12345678	Tens of Millions	10000000
123456789	Hundreds of Millions	100000000

Figures have their value according to the places they are ſet in, as 1 in the firſt place is unity or 1, in the ſecond place ten, in the third place one hundred, in the fourth place one thouſand, in the fifth place ten thouſand, &c.

The Table directs how properly to read or expreſs any number, as 123, which number conſiſts of three places, and is thus read, one hundred and twenty-three.

The number 123456 conſiſting of ſix places, and is thus read or expreſſed, one hundred and twenty-three thouſand four hundred and fifty-ſix; the number 123456789 conſiſting of nine places or numbers is thus read, one hundred and twenty-three millions four hundred and fifty-ſix thouſand ſeven hundred and eighty-nine.

For the eaſe of numeration, or rightly conceiving how to expreſs any number of figures put together, it is uſual to divide them into periods of three figures each, thus, beginning with the unit's place, making a point to the right hand, and counting three figures to the left hand, there make a point or comma for the firſt diviſion: thoſe three firſt figures denote ſo many hundreds and odd numbers; then count on or ſeparate three more places with a point, and this ſecond diviſion or ſeparation will denote ſo many hundred and odd thouſands. Thus proceed, ſeparating every third figure thus,

Mill. Thou. Hund.

123. 456. 789 the firſt period being hundreds and odd, the ſecond hundreds and odd thouſands, the third period hundreds and odd millions; if there had been four periods, it would denote thouſands and odd millions. In every period of figures the firſt number in each period is units, the ſecond figure is tens, the third figure is hundreds.

EXAMPLES.

Expreſs the value of 23643721.

Separate every third figure thus,
23.643.721

The third period being millions, and there being but two places of figures in this period, it will denote that the two firſt figures is twenty-three millions, the ſecond period will be ſix hundred and forty-three thouſand, the third period ſeven hundred and twenty-one.

Expreſs 987654321.

Separate the figures thus,
987.654.321

That is, nine hundred and eighty-ſeven millions ſix hundred and fifty-four thouſand three hundred and twenty-one.

ADDITION.

Addition is the putting two or more numbers together, and bringing them into one total ſum.

And is of one denomination, or ſeveral denominations.

Addition of one denomination is when the numbers of the ſeveral articles are all of one name, that is, are all yards, degrees, miles, &c.

Addition of ſeveral denominations is when the integer or whole number contains parts or under diviſions, as pounds, ſhillings, and pence and farthings, ſo many of the leſs making one of the greater, and by ſome is called Compound Addition.

Numbers to be added together muſt be placed in ſuch order, that units muſt ſtand under units, tens under tens, hundreds under hundreds, thouſands under thouſands, &c.

Thus, if you add 120 feet, 44 and 34 feet together, you muſt ſet down one under the other, as

120
44
34

198

Having

Having placed the numbers to be added, draw a line under them, and beginning at the loweſt figure on the right hand, being the place of units, ſaying 4 and 4 is 8, which put directly under the line, and juſt under its own rank or column, viz. under 4, and then go to the next column or row towards the left hand, then ſay 3 and 4 is 7 and 2 is 9, which ſet under the line juſt under its proper rank, viz. under the 3 4 and 2; then proceed to the next row, where you find but 1, which muſt be ſet down under the line juſt under itſelf; thus the numbers are added together, and you will find that they make one hundred and ninety-eight feet in all.

EXAMPLES.

Ells.	Yards.	Feet.	Pounds.
266	387546	7083576	53764
354	148307	731483	421
460	532181	327514	709
375	761358	2473285	4590
246	253763	637530	53
1701	2083155	11253388	59537

In the firſt Example, 6 and 5 is 11 and 4 is 15 and 6 is 21, in which there are two tens and 1 over, which place under the 6 and carry 2 to the next column, then ſay, 2 you carry and 4 is 6 and 7 is 13 and 6 is 19 and 5 is 24 and 6 is 30, which are three tens; becauſe nothing remains over the tens, ſet down 0 and carry 3 to the next column, then 3 you carry and 2 is five and 3 is 8 and 4 is 12 and 3 is 15 and 2 is 17, which put down, there being no more to add, making the amount of all to be one thouſand ſeven hundred and one. In like manner proceed with the other Examples, and their reſpective ſums total will be found as they ſtand under the lines.

In Addition of ſeveral denominations, it muſt be obſerved how many of the ſmaller names make one of the next greater; as how many farthings make one penny, how many pence make one ſhilling, and how many ſhillings make one pound. I ſhall here place the ſeveral Tables of Money, Weights, Meaſures, &c. immediately before the Examples, they being neceſſary to be firſt known. And firſt,

ADDITION of MONEY.

Note, 4 farthings make 1 penny.
12 pence 1 ſhilling.
20 ſhillings 1 pound.

£. ſtands for pounds.
s. ſtands for ſhillings.
d. ſtands for pence.
qrs. ſtands for farthings.

PENCE TABLE.

		s.	*d.*
20 pence	is	1	8
30	is	2	6
40	is	3	4
50	is	4	2
60	is	5	0
70	is	5	10
80	is	6	8
90	is	7	6
100	is	8	4
110	is	9	2
120	is	10	0

SHILLING TABLE.

		£.	*s.*	*d.*
20 ſhillings	is	1	0	0
30	is	1	10	0
40	is	2	0	0
50	is	2	10	0
60	is	3	0	0
70	is	3	10	0
80	is	4	0	0
90	is	4	10	0
100	is	5	0	0
110	is	5	10	0
120	is	6	0	0

EXAMPLE.

64	7	9
32	14	7
56	13	3
32	10	1
55	16	9
242	2	5

Note. In the column of pence you ſtop at 12, becauſe 12 pence make one ſhilling, making a dot againſt the figure that amounts to 12 or more than 12, and carry what is over 12 to the next figure right above it, and ſo proceed till you come to the top figure, which if it happen to be an even 12, dot againſt it, and put down 0 under the line and under the column of pence, and carry the number of dots made in the addition to the column of ſhillings: but if any figures had been remaining over 12 when you come to the top of the pence column, you put what is over down underneath the ſame and carry the dots to the next.

Obſerve the ſame in the ſhillings, where you are to ſtop at every 20 in the firſt row of ſhillings, or the unit's place of ſhillings, and add for every two in the tens place of ſhillings one poun to the number of dots found in the firſt row, to be carried to the pounds which are to be added up, ſtopping at every ten.

I begin with the firſt column, thus, 9 and 1 is 10 and 3 is 13 and 7 is 20 and 9 is 29.

By the Table 29 pence is 2*s.* 5*d.* being 1 leſs than 30, ſet down the 5*d.* under the pence and carry 2 to the ſhillings.

Then 2 and 6 is 8 and 3 is 11 and 4 is 15 and 7 is 22, which is 2 above 20*s.* or 1*l.* ſet down the 2 in the firſt place of ſhillings, and counting the 4 units in the ſecond row of ſhillings as 2, which added to the 1 I carried from the firſt row of ſhillings, makes 3 to be carried to the firſt column of pounds; then 3 I carry and 5 is 8 and 2 is 10 and 6 is 16 and 2 is 18 and 4 is 22, 2 and carry 2, then 2 I carry to the next row and 5 is 7 and 3 is 10 and 5 is 15 and 3 is 18 and 6 is 24, which ſet down, there being no more to add to it.

By the method of ſtopping without the Table, thus,

In the pence to add them up thus, 9 and 1 is 10 and 3 is 13, which is 1 above 12, dot and carry 1 to the 7 above it makes 8 and 9 makes 17, which is 5 above 12, dot and ſet down the 5, carrying the 2 dots to the next column of ſhillings.

And ſo do for any column of any denomination whatever, only minding what you ſtop at. This method of dotting or marking is very uſeful to beginners, who cannot be ſuppoſed to reckon any other way but by counting as many of one denomination as makes one of another, it being the moſt ſimple idea in his conception.

EXAMPLES.

£.	s.	d.	£.	s.	d.	£.	s.	d.
33	4	9	692	13	8	543	13	$9\frac{3}{4}$
7	15	3	546	14	3	64	12	$3\frac{1}{2}$
13	19	8	696	18	7	445	13	$4\frac{3}{4}$
12	14	3	543	14	3	396	10	$3\frac{1}{2}$
16	18	7	659	19	7	542	13	$2\frac{1}{4}$
12	13	1	843	13	4	654	14	$4\frac{1}{2}$
14	13	4	691	11	9	353	16	$2\frac{3}{4}$
19	18	7	372	11	5	549	12	$7\frac{1}{4}$
16	12	2	540	10	3	632	11	$2\frac{1}{2}$
148	9	8	5588	7	1	4183	17	$4\frac{3}{4}$

AVOIR.

AVOIRDUPOIS WEIGHT.

Marked,

dr.	16 drams make	1 ounce
oz.	16 ounces	1 pound
lb.	28 pounds	1 quarter of an hundred
qrs.	4 quarters	1 hundred
cwt.	20 hundred	1 ton

lb.	*oz.*	*dr.*
3	14	15
6	11	11
5	13	3
6	14	9
8	12	13
6	9	4
38	12	7

Stop at 28 in the firſt column,
4 in the next in the ſecond Example,
10 in the third.

cwt.	*qrs.*	*lb.*
16	3.	27.
14	2	13.
12	1.	16
13	2	19.
16	1	17
13	1.	3
87	1	11

tons.	*cwt.*	*qrs.*	*lb.*
6	3	3	14
5	19	2	27
3	16	1	11
6	13	2	14
3	5	3	9
6	7	2	11
32	7	0	2

Thus 3 and 17 is 20, and 19 is 39, dot againſt the 19. and carry what is more than 28, that is 11 to the 16 above make 27, and 13 make 40, dot againſt the 13 and carry 12, what is over 28, to the 27 above it, dot, ſet down what is over, which is 11, under the 3 in the firſt column, carry the 3 dots to the next, thus, 3 and 1 is 4, dot and carry nothing, then 1 and 2 is 3 and 1 is four, dot, then 2 and 3 is 5, dot and ſet down 1, and carry the 3 dots to the next column, then proceed as before.

LONG MEASURE.

3 barley-corns make	1 inch.
12 inches	1 foot.
3 feet	1 yard.
2 yards	1 fathom.
5½ yards	1 rod, pole, or perch.
40 poles or 220 yards	1 furlong.
8 furlongs	1 mile.
3 miles	1 league.
20 leagues or 60 miles	1 degree.

deg.	*lea.*	*m.*	*fur.*
6	19.	1	3
9	13	2.	5.
6	12.	2	7.
6	13.	1.	6.
4	14	2.	7
34	14	2	4

deg.	*lea.*	*m.*	*fur.*
30	7	2	7
15	8	1	6
13	2	1	7
16	17	2	3
14	7	2	5
90	4	2	4

deg.	*lea.*	*m.*	*fur.*
60	2	1	4
92	18	2	7
64	19	3	2
55	18	2	6
33	12	3	5
307	12	2	0

Firſt Example, 7 and 6 is 13, which is 5 above 8, then 5 and 7 is 12, which is 4 above 8, then 4 and 5 is 9, or 1 above 8, and 1 and 3 is 4, which ſet down, carrying the three dots to the next column, or call it 1, becauſe you ſtop at 3 in the ſecond column, then 2 and 1 is 3, dot, then 2 and 2 is 4, dot and carry 1, and 1 is 2, which ſet down and carry 3 to

the leagues, then 3 and 14 is 17 and 13 is 30, dot againſt the 13 and carry 10, then 10 and 12 is 22, dot and carry 2, then 13 and 2 I carry is 15 and 19 is 34, dot and ſet down 14 and carry the 3 dots to the next, then as before.

TIME.

60 ſeconds is	1 minute.	*min.*
60 minutes	1 hour.	*ho.*
24 hours	1 day.	*da.*
7 days	1 week.	*we.*
4 weeks	1 month.	*mon.*
13 months 1 day 6 hours	1 common or Julian year.	

we.	*da.*	*ho.*	*min.*
21	4	19.	12
32	3.	16	42
36	6.	18.	46.
54	3	9	19
145	4	15	59

mo.	*we.*	*da.*	*ho.*
3	3	6	12
4	2.	5	14
6	3	4	19
7	2	5	22
23	1	1	19

yea.	*mo.*	*we.*	*da.*
5	11.	3	4
6	9	2	6
8	12	3	5
9	2	2	2
30	11	0	3

Example 1, thus, 19 and 46 is 65, which is 5 above 60, dot and carry 5 to the next above, viz. 5 and 42 is 47 and 12 is 59, which ſet down, carrying 1 dot to the next column, then 1 and 9 is 10 and 18 is 28, dot and carry 4, and 16 is 20, and 19 is 39, dot and ſet down 15, what 39 is above 24, or their difference, carry the two dots to the next column of days, 2 and 3 is 5 and 6 is 11, dot and carry 4, then 4 and 3 is 7, dot and ſet down the 4 above it, under the line under the column for days, carry the two dots to the laſt column of weeks, which add as uſual.

MOTION.

″	60 ſeconds make	1 prime minute.
′	60 minutes	1 degree.
°	30 degrees	1 ſign.
	3 ſigns	1 quadrant.
	12 ſigns, or 4 quadrants	1 great circle of the Zodiac.

ſig.	°	′	″
3	27.	29.	30.
4	6	9	7
5	28.	37	42
6	27.	15.	13.
4	5	49	53
25	5	21	25

cir.	*ſig.*	°	′	″
3	11	15	30	39
6	8	14	7	28
7	6	4	19	12
3	9	16	12	27
5	8	4	28	3
4	7	6	19	16
32	3	0	57	5

cir.	*ſig.*	°	′	″
3	11	15	30	39
7	6	4	19	12
6	8	14	7	28
3	9	16	12	27
5	8	4	28	3
4	7	6	19	16
32	3	0	57	5

Thus, firſt Example, 53 and 13 is 66, dot and carry 6, and 6 and 42 is 48 and 7 is 55 and 30 is 85, which is 25 above 60, dot and ſet down the 25 under the line under 53 in the firſt column it belongs to, and carry the two dots to the next column, then 2 I carry and 49 is 51 and 15 is 66, dot and carry 6, then 6 and 37 is 43 and 9 is 52 and 29 is 81, dot and ſet down 21 carrying 2 to the next column, then 2 and 5 is 7 and 27 is 34,

dot

dot and carry 4, then 4 and 28 is 32, dot and carry 2, 2 and 6 is 8 and 27 is 35, dot and ſet down 5, and carry the three dots to the laſt column of ſigns, then as before in ſimple Addition.

SUBTRACTION.

Subtraction is the method of taking one number from another, and ſhewing the remainder. If there be different denominations of the quantities given, place each denomination of the number to be ſubtracted under the ſame name of the number it is to be ſubtracted from, and when ſubtraction cannot be made, borrow as many of that denomination as makes unity of the following denomination, and then ſubtract, carrying one to the under number in the next column, or adding one thereto. Obſerve the ſame in every ſucceeding denomination, till you come to the laſt or higheſt denomination. To prove Subtraction, add the remainder and the number to be ſubtracted together, their ſum, if rightly done, will be the ſame as the top number.

EXAMPLES.

From	45963	From	12396054	From	654321690
Take	27549	Take	9076583	Take	374563279
Remains	18414	Remains	3319471	Remains	279758411

Thus in whole numbers, Example 1, 9 from 3 I cannot take, but borrowing 10 and add it to 3, then from 13 remains 4, which I ſet down and carry 1 to the 4 in the next, which makes 5, then 5 from 6 above it remains 1, which put down directly underneath, then 5 from 9 and 4 remains to be put down directly under it; next 7 from 5 I cannot take, but borrowing 10, then 7 from 15, remains 8 to be put down, and 1 I carry to the next, then 1 and 2 is 3 and 3 from 4 remains 1, and all is done, the remainder being 18414, and ſo proceed with the other Examples.

SUBTRACTION OF MONEY.

	£.	s.	d.		£.	s.	d.		£.	s.	d.
From	54	16	7	From	96	17	11	From	5046	13	$3\frac{1}{4}$
Take	32	19	11	Take	84	19	$11\frac{1}{2}$	Take	4097	17	$9\frac{1}{2}$
Remains	21	16	8	Remains	11	17	$11\frac{1}{2}$	Remains	948	15	$5\frac{3}{4}$

Example 1. 11 from 7 I cannot take, therefore I borrow 12*d.* or 1*s.* then 12 and 7 is 19, from which taking 11 remains 8, and carry 1 to the 19 in the next column, which makes 20*s.* then 20 from 16 I cannot, but by borrowing 20, and adding it to 16 make 36, 16 remaining, ſet down the 16 beneath it, and carry one to the next column, that is, 1 and 2 is 3, which taken from 4 above it, remains 1, then 3 from 5 remains 2, and all is finiſhed; and thus proceed with the other Examples.

SUBTRACTION OF AVOIRDUPOIS WEIGHT.

	Ton	*cwt.*	*qrs.*	*lb.*		*lb.*	*oz.*	*dr.*		*cwt.*	*qrs.*	*lb.*
From	6	12	2	3	From	64	14	15	From	20	1	19
Take	3	16	3	25	Take	33	15	11	Take	17	2	20
Remains	2	15	2	6	Remains	36	15	4	Remains	2	2	27

Example

Example 1. Here 25 from 3 I cannot take, therefore I borrow 28, becauſe 28 make 1 of the next denomination, then 28 and 3 is 31, from which taking 25 there remains 6, and carry 1 to the next bottom figure 3, which makes 4, or 1 *cwt.* then 4 from 6 I cannot, but by borrowing 4 makes 6, then 4 from 6 and 2 remains, carry 1, and ſet down the 2 under the line, then 1 and 16 is 17, but 17 from 12 I cannot take, but 17 from 32, borrowing 20, there remains 15, which put down, carrying 1 to the 3, the under figure in the next denomination, which makes 4, and 4 from 6 there remains 2, and all is finiſhed.

SUBTRACTION OF LONG MEASURE.

	feet	*in.*		*mi.*	*fur.*	*yar.*		*mi.*	*fur.*	*yar.*
From	21	$3\frac{3}{4}$	From	9	4	120	From	24	0	60
Take	11	$9\frac{1}{2}$	Take	6	7	180	Take	12	3	90
Remains	9	$6\frac{1}{4}$	Remains	2	4	160	Remains	11	4	190

In the firſt Example, $\frac{1}{2}$ from $\frac{3}{4}$ remains $\frac{1}{4}$, which put down, then 9 from 3 I cannot take, but borrowing 12, I ſay 9 from 15 there remains 6, which ſet down, carrying 1 to the 11 in the next denomination, which makes 12, and 12 from 21 remains 9, and it is done.

In the ſecond Example, 180 from 120 I cannot take, therefore I borrow 220, becauſe 220 yards make 1 furlong, which added to the 120 makes 340, from which taking the 180, remains 160 to be ſet down and 1 to carry, then 1 and 7 is 8, which is the number I ſtop at in the next column, for which carry 1 and ſet down the 4 under the line, then 1 I carry and 6 make 7, and 7 from 9 remains 2.

In the third Example, 90 from 60 I cannot, then borrowing 220 and 60 is 280, from whence taking 90 remains 190, which put down, carrying 1 to the three in the next denomination, which makes 4, then 4 from 0 I cannot, but 4 from 8 (here borrow 8) remains 4, and carry 1 for what I borrowed, then 1 and 2 is 3, which taken from 4 remains 1; laſtly, 1 from 2 remains 1, and all is done.

SUBTRACTION OF TIME.

	Ye.	*mo.*	*w.*	*d.*	*h.*	*min.*		*da.*	*h.*	*mi.*	*ſec.*
From	90	9	2	3	7	6	From	30	6	7	50
Take	36	11	3	6	9	23	Take	21	9	36	54
Remains	53	10	2	3	21	43	Remains	8	20	30	56

Firſt Example, thus, 3 from 6 remains 3, then the next figure 2 or 20 take from 60 remains 4, which put down in the ten's place next to the 3, it being 40, and carry 1 to the 9 in the next denomination, then 1 and 9 is 10, but 10 from 7 I cannot, therefore I borrow 24, and 24 and 7 is 31, from which taking 10 remains 21, which put down, carrying to the 6 following of the days, which make 7 or 1 week, for which I carry 1 and put down the 3 under the line of the ſame row, and carrying 1, then 1 and 3 make 4, but 4 weeks is 1 month, whence I put down under it the 2 remaining, and carry 1 to the next 11, which make 12 months, but 12 from 9 I cannot take, but 12 from 13 remains 1, and 1 and 9 above it is 10, which put down, and carry 1 to the 6 in the laſt denomination of years, which makes 7, then 7 from 0 I cannot, but 7 from 10 3 remains, which put down, carrying 1, then 1 and 3 is 4, and 4 from 9 remains 5, and all is done.

SUBTRACTION or MOTION.

	cir.	sig.	°	′	″
From	60	10	23	49	53
Take	16	9	26	53	58
Remains	44	0	26	55	55

	cir.	sig.	8	′	″
From	63	4	5	33	44
Take	12	9	23	46	52
Remains	50	6	41	46	52

First Example, thus, 58 from 53 I cannot, but 8 from 13 remains 5, which put down, carrying 1 to the 5, which makes 6, or rather 60, then put down the 5 above or over 60 under the line, and carry 1 to the next 3, which makes 4, and 4 from 9 remains 5; then 5 from 4 I cannot, but 5 from 6 remains 1, and 1 and 4 above it makes 5, which put down, and carry 1 for the 6 you borrowed to the next 26 degrees, it makes 27, which cannot be taken from 23, therefore borrow 30, and taken from it remains 3, and 3 and 23 is 26, which put down, carrying 1 to the next 9 signs, which makes 10, then 10 from 10 remains 0, which place down, and lastly, 6 from 10 remains 4 carrying 1 and 1 is 2, and 2 from 6 remains 4, and all is done.

MULTIPLICATION

Is a shorter way of performing Addition, or summing up how often any number is repeated, and is performed by the following

TABLE.

2 times 2 is 4
3 6
4 8
5 10
6 12
7 14
8 16
9 18
10 20
11 22
12 24

3 times 3 is 9
4 12
5 15
6 18
7 21
8 24
9 27
10 30
11 33
12 36

4 times 4 is 16
5 20
6 24
7 28
8 32
9 36
10 40
11 44
12 48

5 times 5 is 25
6 30
7 35
8 40
9 45
10 50
11 55
12 60

6 times 6 is 36
7 42
8 48
9 54
10 60
11 66
12 71

7 times 7 is 49
8 56
9 63
10 70
11 77
12 84

8 times 8 is 64
9 72
10 80
11 88
12 96

9 times 9 is 81
10 90
11 99
12 108

10 times 10 is 100
11 110
12 120

11 times 11 is 121
12 132

12 times 12 is 144

EXAMPLES.

Multiply 3723 called the multiplicand, or number to be multiplied.
by 3 called the multiplier, or multiplying number.

11169 called the product, and is what the multiplication produces.

Say 3 times 3 is 9, which put down under the 3 or unit's place, then 3 times 2 is 6, which place down under the 2 you multiplied, then 3 times 7 is 21, for which put down 1 under the 7, and carry 2 to the product of the next multiplying figure, which is 3, that is, 3 times 3 is 9 and 2 I carried makes 11, which put down, as all the figures are multiplied. The same number put down 3 times and added up will give the same number, thus,

3723
3723
3723

11169 sum as above.

Multiply 76343 by 9
9

687087 product.

The above product, to have found it by addition, would have had the number 76343 to have been put down under one another 9 times, to have produced it when all was added up.

Multiply 584632 by 10
10

5846320

Observe if you multiply by 10, it is only annexing an 0 to the number.

If you multiply by 100, put two noughts to the number.

If you multiply by 1000, put three ciphers to the number given, and it is done, and so on.

Multiply 1463462 by 11
11

16098082

Multiply 3476325 by 12
12

41715900

When the multiplier is greater than 12, that being the highest multiplying number in the Table, the operation is to be performed in two or more lines, or according to the number of figures in the multiplier, that is, as many single figures so many single lines or products, and then these products all added up together give the product of the whole.

EXAMPLES.

Multiply 12345 by 23
23

37035
24690

283935 product.

Multiply the multiplicand by the first figure of the multiplier as before, then for the second line or product

Multiply 324354 by 203
203

973062
648768

65843862 product.

Thus, in this Example above, the product of the multiplicand 324354 by the 2 in the multiplier, the first figure,

belonging to the ſecond figure, multiplying the unit's place of the multiplicand by the ten's place of the multiplier, place the firſt figure of the product under the ten's place of the multiplier, then multiply all the reſt of the figures of the multiplicand by the ſame figure in the ten's place of the multiplier, as in common, placing all the figures regularly one figure backwards of the firſt line, and ſo on if there were more figures in the multiplier.

figure of the product 8, or two times 4, is placed directly under the 2 in the multiplier, being the third figure, in the multiplier, and all the reſt ſucceſſively in order figure under figure, and when the products of each figure of the multiplier are all finiſhed, they then are all to be added up for the product of the whole, as in the following Examples.

Note. Whatever figure of the multiplier you multiply by, the firſt figure of the product muſt be placed directedly under that very figure. Suppoſe you multiply by the fourth figure of the multiplier, the firſt figure of the product is to be placed under the fourth figure in the top line.

Multiply	763219 by 954	685413	650370
	954	7602	3605
	3052876	1370826	3251850
	3816095	4112478	3902220
	6868971	4797891	1951110
	728110926	5210509626	2344583850

MULTIPLICATION OF MIXED NUMBERS.

To multiply any number by the component parts of the multiplier; as, ſuppoſe the number 6523 be to be multiplied by 48, therefore firſt multiply by 8, then that product ariſing multiply again by 6, becauſe 6 time 8 is 48.

6543	6543
8	48
52344	52344
6	26172
314064	Proof 314064

If the multiplier cannot be broke into two or more numbers whoſe products correſpond thereto, the multiplicand may be multiplied by the remaining number of times wanting, and added to the product of the reſt.

Multiply 56324 by 76		Multiply 754 by 26 ½.	
6		5	
337944		3770	
12		5	
4055328	= 72 times.	18850	= 24 times.
225296	= 4 times.	754	= once.
		377	= half.
Anſ. 4280624	= 76 times.	19981	Product.

In 63 fodder of lead, each 19½ *cwt.* how many hundred weight?

19 ½ or thus, 63
7 3
136 ½ 189
9 6
1228 ½ 1134 = 18 times.
63 one.
31 ½ half.
1228 ½

There are 50 men to have 19*s.* each how much money will pay them?

50 or 19
3 7
150 133
6 7
900 931
50 19
950 ſhillings 950 ſhillings.

I ſhall now ſhew the excellent uſe of Multiplication, in anſwering all manner of queſtions that ordinarily occur in buſineſs, when we have the price of one thing, and want to know the value of many things at the ſame rate, which it eaſily performs, anſwering every purpoſe of the Rule of Three, and that in a much more conciſe and elegant manner, nothing being more here required, than to know how to carry from one denomination to another the next in order, which is performed with the greateſt eaſe and expedition.

	s.	*d.*	
Multiply	19	8	by 3
		3	
£ 2	19	0	Anſwer.

I ſay three times 8 is 24 pence or 2*s.* as there are no pence above the even ſhillings, ſet down a cipher in the pence place, and carry 2 to the ſhillings, thus 3 times 9 is 27 and 2 I carried is 29, ſet down the 9 and there are two tens to carry, then 3 times 1 is 3 and 2 I carry make 5 times ten ſhillings, or 2*l.* 10*s.* place 1 for the 10*s.* againſt the 9 in the ſhillings place, and ſet down 2 in the pounds place.

How much does 10 gallons of brandy come to at 9*s.* 6*d.* per gallon?

s.	*d.*
9	6
	10
4 15	0

Thus, 6 times 10 is 60 pence or 5*s.* ſet down 0 and carry 5 to the ſhillings, then 10 times 9 is 90, and 5 I carried makes 95 ſhillings, which is 4*l.* 15*s.*

Note, it is moſt convenient always to make the price the multiplicand and the quantity the multiplier.

What will 11*oz.* of ſilver come to at 5*s.* 5*d.* ½ per *oz.*?

s.	*d.*
5	5 ½
	11
3 0	0 ½ Anſwer.

Thus, 11 halfpence is 5*d.* ½, ſet down the halfpenny and carry 5 to the pence, then 11 times 5 is 55 and 5 I carried make 60 pence or 5*s.* carry 5 to the ſhillings, then 11

What will 12 dozen of eggs come to at 1*s.* 3*d.* ½ per dozen?

s.	*d.*
1	3 ½
	12
15	6

Here 12 halfpence is 6*d.* carry 6 to the pence, then 3 times 12 is 36 pence and 6 I carried is 42 pence, or 3*s.* 6*d.* put down the 6 pence in the pence place, and carry 3 to the ſhillings

times 5 is 55 and 5 I carried is 60 ſhillings or 3 even pounds, ſet down 0 in the ſhillings place, and place the 3 in the pounds place, and the anſwer will be three pounds and one halfpenny.

What come 12 ſheep to at 19*s.* 6*d.* each?

s.	*d.*
19	6
	12
£11 14	0

What come 12 pair of ſilk ſtockings to at 14*s.* 6*d.* $\frac{1}{2}$ per pair?

s.	*d.*
14	6 $\frac{1}{2}$
	12
£8 14	6

Note, It is beſt to multiply the ſhillings as ſimple numbers, for every 10 carry 1, and then to halve the tens of ſhillings, which half is always ſo many pounds, and if they halve even, ſet down a cipher in the tens of ſhillings place, but if odd, then ſet down 1 in that place, and carry the half number of tens remaining to the pounds, as in both the laſt Examples.

When the quantity exceeds 12, find two numbers in the Multiplication Table which being multiplied together will make the quantity, then multiply the price by one of the numbers (it matters not which you multiply firſt by) and then that product by the other number, and the laſt product will be the anſwer.

What will 24 gallons of brandy come to at 12*s.* 6*d.* per gallon?

l.	*s.*	*d.*
0	12	6
		4
2	10	0
		6
15	0	0

How much will 64lb. of tea come to at 8*s.* 9*d.* $\frac{1}{2}$ per pound?

l.	*s.*	*d.*
0	8	9 $\frac{1}{2}$
		8
3	10	4
		8
28	2	8 Anſwer.

What will 120 quarters of corn come to at 22*s.* 6*d.* per quarter?

l.	*s.*	*d.*
1	2	6
		10
11	5	0
		12
135	0	0 Anſwer.

What will 77 cwt. of madder come to at 3*l.* 15*s.* 9*d.* per cwt.?

l.	*s.*	*d.*
3	15	9
		7
26	10	3
		11
291	12	9 Anſwer.

What will 132 yards of tabby come to at 5*s.* 11*d.* $\frac{3}{4}$ per yard?

l.	*s.*	*d.*
0	5	11 $\frac{3}{4}$
		11
3	5	9 $\frac{1}{4}$
		12
36	9	3 Anſwer.

What will 144 gallons of wine come to at 6*s.* 9*d.* per gallon?

l.	*s.*	*d.*
0	6	9
		12
4	1	0
		12
48	12	0 Anſwer.

When

When the quantity is ſuch a number that no two numbers in the Table can be found to anſwer it, then multiply by two ſuch numbers as come neareſt to the number given, either under it or over it, what it wants of the number, multiply the multiplicand thereby, and add it to the laſt product, and the ſum will be the anſwer, and if over, ſubtract ſo many times the multiplicand from the laſt product, and the remainder will be the anſwer.

What will 39 cwt. of currants come to at 2*l.* 14*s.* 9*d.* per cwt.?

£.	*s.*	*d.*	
2	14	9	
		3	
8	4	3	
		12	
98	11	0	or 36 times.
8	4	3	or 3 times.
Anſ. 106	15	3	or 39 times.

What will 76 cwt. and $\frac{3}{4}$ of ſhip biſcuit come to at 13*s.* 6*d.* per cwt.?

£.	*s.*	*d.*	
0	13	6	one hundred
		7	
4	14	6	ſeven hundred.
		11	
51	19	6	77 hundred comes to.
	13	6	ſubt. 1 hund. comes to.
51	6	0	76 hundred comes to.
	6	9	add what $\frac{1}{2}$ cwt comes to.
	3	$4\frac{1}{2}$	add what $\frac{1}{4}$ cwt, comes to.
Anſwer	51	16	$1\frac{1}{2}$

What will 87 ells of Holland come to at 3*s.* 5*d.* $\frac{1}{2}$ per ell?

£.	*s.*	*d.*	
0	3	$5\frac{1}{2}$	
		8	
1	7	8	
		11	
15	4	4	= 88 ells come to.
	3	$5\frac{1}{2}$	ſubtract 1 ell.
Anſ. 15	0	$10\frac{1}{2}$	= 87 ells.

or thus,

s.	*d.*	
3	$5\frac{1}{2}$	
	7	
1	4	$2\frac{1}{2}$
	12	
14	10	6 = 84 ells,
	10	$4\frac{1}{2}$ add 3 ells.
15	0	$10\frac{1}{2}$ as per contra.

What will 960 lb. of Bohea tea come to at 7*s.* 6*d.* per pound?

£.	*s.*	*d.*	
0	7	6	
		10	
3	15	0	= 10 pounds.
		8	
30	0	0	= 80 pounds.
		12	
Anſ. 360	0	0	= 960 pounds.

What will 85 cwt. of cheeſe come to at 20*s.* 6*d.* per cwt.

£.	*s.*	*d.*	
1	6	6	
		7	
9	5	6	
		12	
111	6	0	
	1	6	6 for the 1 cwt. wanting.
112	12	6	Anſwer.

Thus

Thus by the foregoing Examples it is manifeſtly ſeen, that when the price of any thing is given, the amount of many at the ſame rate may be obtained by Multiplication only.

When your ſum is 1, 2, 3, 4, or more hundreds, always multiply the price by 10, and that product by 10 alſo, which produces the value of one hundred, then multiply that product by the number of hundreds or figure in the hundreds place, and that product is the value of ſo many hundreds as there are; then for the tens, whether 20, 30, 40, &c. multiply that product by the figure in the tens place of the multiplier, which place under the laſt product without drawing a line; and for the units, always multiply the price by the figure in the units place of the multiplier. and ſet the product under the laſt, ſo that you will have three lines to add together, and the total of them is always the anſwer.

An Example or two will make it eaſy to be underſtood.

What will 648 lb. of indigo come to at 5*s*. 6*d*. per pound?

l.	*s*.	*d*.	
	5	6	
		10	
2	15	0	value of 10 lb.
		10	
27	10	0	value of 100lb.
		6	
165	0	0	value of 600 lb.
11	0	0	value of 10 mult. by 4.
2	4	4	price multiplied by 8.
178	4	0	Anſwer.

What will 355 ells of Holland come to at 2*s*. 3*d*. $\frac{1}{2}$ per ell?

l.	*s*.	*d*.	
	2	$3\frac{1}{2}$	
		10	
1	2	11	value of 10 ells.
		10	
11	9	2	value of 100 ells.
		3	
34	1	6	value of 300 ells.
5	14	7	value of 10 mult. by 5
	11	$5\frac{1}{2}$	value of 5.
40	7	$6\frac{1}{2}$	Anſwer.

In this firſt Example, I multiply the price 5*s*. 6*d*. by 10 for the value of 10, that product I multiply by 10, which produces the value of 100lb. that product I multiply by 6, the number of hundreds, the product is the value of 600lb. then I multiply the value of 10lb. by 4, which makes the value of 40lb. which I ſet under the laſt product; laſtly I multiply the price by 8, and place it under the laſt product, the ſum of theſe products is the value of the whole quantity of 648lb.

Thus you may eaſily perceive, that the price and quantity be what it will, the amount or value is eaſily and elegantly obtained, anſwering every purpoſe of the Rule of Three, or the Rules of Practice, and conſequently muſt be of the utmoſt ſervice to thoſe who have not time to dip largely into the ſcience of Arithmetic, and for whoſe purpoſe I have peculiarly adapted it, as there is nothing that cannot be eſtimated thereby. I have inſiſted the longer on this excellent method that it might be well underſtood, not only for its elegant, expeditious, and eaſy diſpatch of ordinary affairs, but for its utility in contracting many operations in other Rules, as Reduction, the Rule of Three, Practice, &c.

FURTHER EXAMPLES.

What will 648 lb. of indigo come to at 4*s.* 6*d.* per lb. ?

	£.	s.	d.	
		4	6	
			10	
	2	5	0	value of 10
			10	
	22	10	0	value of 100 lb.
			6	
600	135	0	0	value of 600 lb.
40	9	0	0	val. of 10 mult. by 4
8	1	16	0	value of 8, or 8 times the price
648	145	16	0	

What will 8954 gallons of rum come to at 3*s.* 5*d.* per gallon ?

	£.	s.	d.	
		3	5	
			10	
	1	14	2	value of 10 gal.
			10	
	17	1	8	value of 100 gal.
			10	
	170	16	8	value of 1000 gal.
			8	number of 1000
8000	1366	13	4	value of 8000 gal.
900	153	16	0	value of 100 by 9
50	8	10	10	value of 10 by 5
4		13	8	value of price by 4
8954	1529	12	10	

QUESTIONS FOR PRACTICE.

5918 yards of canvas, at 9*d.* $\frac{3}{4}$. Anſwer 240*l.* 8*s.* 4*d.* $\frac{1}{2}$.
1612 yards of Holland, at 15*d.* $\frac{1}{4}$. Anſwer 102*l.* 8*s.* 7*d.*
9990 yards at 23*d.* $\frac{3}{4}$. Anſwer 988*l.* 11*s.* 10*d.* $\frac{1}{2}$,
1263 cwt. of butter, at 5*d.* $\frac{1}{2}$ per cwt. Anſwer 1529*l.* 12*s.* 10*d.*
36 ells of Dutch lawn, at 5*l.* 13*s.* per ell. Anſwer 304*l.* 8*s.*
36 barrels of rice, each barrel containg in 1 cwt. 3 qrs. at 2*d.* $\frac{3}{4}$ per lb. Anſwer 80*l.* 17*s.*
134 $\frac{1}{2}$ cwt. raiſins, at 31*s.* 6*d.* per cwt. Anſwer 208*l.* 13*s.* 8*d.* $\frac{1}{4}$.

DIVISION

Is a Rule by which we diſcover how often any number is contained in another, and is a ſhorter way of performing many Subtractions.

There are four diſtinct parts in Diviſion.

1. The Dividend, or number to be divided.
2. The Diviſor, or the number you divide the Dividend by.
3. The Quotient, or the number of times the Diviſor is contained in the Dividend.
4. The Remainder, or what remains after the work is finiſhed, which is always of the ſame name with the Dividend, and muſt be always leſs than the Diviſor, it being ſo many remaining parts of the Dividend, the Dividend always expreſſing how many the whole quantity contains: and this is the uncertain part, becauſe there is ſometimes a Remainder, and ſometimes not.

Divide 7420 by 5

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5 ) 7420 (
    1484
```

Seek how often 5 is contained in 7, the firſt figure of the dividend, and it can be once taken from it, put down 1 under the 7, and carry what 7 is over

over 5 to the next figure 4, which will make 24, then ſeek how often 5 is contained in 24, and it will go 4 times and 4 over, put down the 4 underneath the 4 the next figure, and carry 4 to be joined to the 2 the next following figure, which will be 42, then how often 5 in 42, anſwer 8 times and 2 over, place the 8 under the 2, and carry 2 to be joined to the next figure 0, which makes 20, then how often 5 in 20, anſwer 4 times which place under the laſt figures 0; there being no other figures to divide it is finiſhed, and the quotient is 1484.

3)67321	4)54263	5)65426	6)37609	7)963420
22440 $\frac{1}{3}$	13565 $\frac{3}{4}$	13085 $\frac{1}{5}$	6268 $\frac{1}{6}$	137631 $\frac{3}{7}$

8)584630	9)473260	10)4760	1|0)54632007|0
73078 $\frac{6}{8}$	52584 $\frac{4}{9}$	4760	5463207

Note, When a number is to be divided by 10, it is moſt eaſy to cut off the laſt figure to the right hand, and is done.

If you would divide by 100 cut off two figures, if by 1000 cut off three figures, that is, cut off a many figures as there are ciphers in the diviſor.

Divide 11)685496(by 11 — 62317 $\frac{9}{11}$

12)67239854(— 5603321 $\frac{2}{12}$

To prove Diviſion, multiply the quotient by the diviſor, adding the remainder to the product, if the ſum is the ſame with the dividend the work is right.

When the diviſor is a greater number than 12, and contains 2, 3, 4, 5, 6, &c. figures, ſet off as many figures to the left hand as there are figures in the diviſor, unleſs the firſt figure of the diviſor is greater than the firſt figure of the dividend; if it be greater, then ſet off one more, ſeeking how often the firſt figure in the diviſor is contained in the two firſt figures of the dividend, or how often the two firſt figures of the diviſor are contained in the firſt three figures of the dividend, put the anſwer in the quotient, and multiply the whole diviſor by that quotient figure, ſubtracting the product from the dividend, and bringing down the next figure; if when the next figure thus brought down, together with the remainder, make not ſo many figures as there are in the diviſor, ſet a cipher in the quotient and bring down another figure, and ſo on, until there are figures enough to take the diviſor from, and thus proceed till you bring down the laſt figure of the dividend. A few Examples will make this plain and eaſy.

Divide 27634106 by 23.

```
23) 27634106 (1201482
    23
    ---
     46
     46
     --
      034
       23
       --
       111
        92
        --
        190
        184
        ---
         66
         46
         --
         20
```

Here the two first figures of the divisor are contained once in the two first figures of the dividend; then taking 23 from 27 remains 4, which, after drawing a line, place under the 3; bring down to join it to the next figure 6, making 46, then how often 23 in 46, answer 2 times, place 2 in the quotient, multiply 23 by 2 which is 46, and place it under 46, there remains 0 when taken from the 46 above it; bring down another figure 3, and 23 cannot be contained therein, therefore put a cipher in the quotient, and bring down the next figure 4 making 34, then 23 in 34 will be 1, which put in the quotient, and subtracting 23 from 34 remains 11, to which bring down the next figure 1 makes 111, then how often 23 in 111, answer 4 times or 92, which taken from 111 remains 19, to which bring down the next figure 0, which makes 190, then how often 23 in 190, answer 8 times, put 8 in the quotient, and subtracting 8 times 23, equal to 184, from 190, remains 6, to which bring down the last figure 6, which makes 66, then how often 23 in 66, answer 2, put 2 in the quotient, and 46 taken from 66, remains 20, the last remainder.

```
339) 1234567 ( 3641 quot.
     1017
     ----
      2175
      2034
      ----
       1416
       1356
       ----
        607
        339
        ---
        268 remainder.
```

Proof by Multiplication.

```
  3641
   339
  ----
 32769
 10923
 10923
   268 remainder added.
 -----
1234567
```

```
4642) 6237146 (1343
      4642
      ----
       15951
       13926
       -----
        20254
        18568
        -----
         16866
         13926
         -----
          2940
```

```
56423) 10370306 ( 189
       56423
       -----
        506070
        451384
        ------
         566866
         507807
         ------
          39059
```

Division

Diviſion is often performed by the component parts of the diviſor; as, ſuppoſe 3600*l.* is to be divided among, 72 men for prize money, then, becauſe 6 times 12 is 72, divide the number firſt by 6, and the quote ariſing again by 12, thus,

9) 3600 (

12) 600

£.50 anſwer, each man's ſhare.

At length thus,

72 (3600 (50
3600

DIVISION OF MONEY.

To divide money, &c. without reducing it into any ſubordinate denomination, is exceeding uſeful, and withal a more elegant way than the common, as may be ſeen by compariſon.

Divide 12*l.* 10*s.* 6*d.* among 5 perſons.

l.	*s.*	*d.*
5) 12	10	6
2	10	1 $\frac{1}{5}$ Anſwer.

I ſeek how often 5 in 12, it goes 2 times; put 2 under the pounds place, and carrying 2*l.* or 40 ſhillings to the ſhillings place, then 40 and 10 is 50 ſhillings; how often 5 in 50, anſwer 10 times, put 10 in the ſhillings place and none over; ſeek how oft 5 in 6 pence, anſwer 1*d.* and 1 over, put 1 penny in the pence place, and $\frac{1}{5}$ remains.

Anſwer £2 10 1 $\frac{1}{5}$

Divide 67*l.* 9*s.* 4*d.* among 8 perſons.

l.	*s.*	*d.*
8) 67	9	4
8	8	8

If 5 gallons of brandy coſt 1*l.* 16*s.* 8*d.* what is it per gallon?

l.	*s.*	*d.*
5) 1	16	8
0	7	4 Anſwer.

Divide 5261*l.* 11*s.* 4*d.* by 64.

8) 5261 11 4

8) 657 13 11

82 4 2 $\frac{3}{4}$ Anſwer.

When the price of an hundred weight is given, to find the worth of one pound. Rule, divide by 7, then again by 8, and halve the laſt quotient.

EXAMPLE.

If 112 lb. of iron coſt 2*s.* 4*d.* what is it per pound?

s.	*d.*
7) 2	4
8)	4
2)	$\frac{1}{2}$
Anſwer	$\frac{1}{4}$

If 112 lb. of lead coſt 7*s.* what is it per pound?

s.	*d.*
7) 7	0
8) 1	0
4) 1	$\frac{1}{2}$
Anſwer	$\frac{3}{4}$ per pound.

REDUCTION

Is the method of reducing numbers from one denomination to another, retaining the ſame value.

To reduce a number consisting of several names to their least name.

CASE I.

Rule 1st. Multiply the first or greatest name by the parts which an unit contains of the next less name, adding to the product the parts of the second name in the given number.

2d. Multiply the last sum by the number of units that an unit of the next less name is contained in one of the second name, adding to the product the parts of the third name contained in the given quantity, and thus proceed till the last name in the given number is arrived at.

In 8 *lb.* 10 *oz.* of gold, how many grains?

lb.	*oz.*
8	10
12	
106	
20	
2120	
24	
8480	
4240	

50880 grains.

In 56*l.* 19*s.* 6*d.* ½, how many farthings?

l.	*s.*	*d.*
56	19	6 ½
20		
1139		
12		
13674		
4		

54698 Ans. in farthings.

In 30° 48′ 27″ 59‴, how many thirds?

°	′	″	‴
30	48	27	59
60			
1848			
60			
110907			
60			

6654479 Answer.

In a cannon of 2 *tons*, 14 *cwt.* 3 *qrs.* 19 *lb.* how many pounds?

tons	*cwt.*	*qr.*	*lb.*
2	14	3	19
20			
54			
4			
219			
28			
1771			
438			

6151 pounds. Answer.

CASE II.

A number of an inferior name being given, to find how many of each superior denomination are contained therein.

Rule 1st. Divide the given number by the number of times that one of its units is contained in an unit of the next superior name.

2d. Divide this quotient by the parts making one of the next name.

3d. Divide the quotient by the parts making one of the next name, and proceed in this manner till the highest name is obtained.

4th. Then the last quotient, and the several remainders, will be the parts of the different names contained in the given number.

EXAM-

EXAMPLES.

In 2278 farthings, how many pounds, shillings and pence?

4) 22778

12) 5694 2

2|0) 47|4 : 6

Anſwer £. 23 14 6½

In 6151 pounds, how many tons, cwts. and quarters?

28) 6151 (219 quarters.
56

55
28

271
252

4)219(3 qrs.
2|0)5|4

19lb. 2 14 3 19

tons cwt. qrs. lb.
Anſwer 2 14 3 19

In 207583 ſeconds, how many degrees?

6|0) 207583|3 (

6|0) 3459 43

57 39 4

Anſwer 57° 39′ 43″

In 6151 lb. how many tons, cwt. qrs. and pounds?

4)6151(3 4×4=16+3=19.

7)1537(4

4)219(

2|0)5|4 3 qrs.
tons cwt. qr. lb.
Anſwer 2 14 3 19

RULE OF THREE, OR GOLDEN RULE.

In this Rule, I make no diſtinction between the Rule of Three direct, or inverſe, they both being to be performed by the ſame precepts.

This is called the Rule of Three, from its having three numbers given to find a fourth in proportion to them, that is, the fourth term always bears the ſame proportion to the third that the ſecond does to the firſt, which fourth number when found is an anſwer to the queſtion. It is alſo called the Golden Rule, from its excellent uſe in all performances in Arithmetic; and ſometimes it is called the Rule of Proportion.

RULE.

1ſt. Set down the middle number, which always bears the ſame name with the anſwer ſought.

2d. Conſider in your mind if your anſwer is to be greater or leſs than this ſecond term or number, which will be eaſily known from the nature of the queſtion.

3d. If your anſwer is to be leſs, place the greater of the other two given numbers for the firſt term in the proportion, but if your anſwer is to be greater, place the leaſt of the two given numbers for the firſt term, and the remaining term in the third place.

4th. Multiply the ſecond and third terms together, and divide the product ariſing by the firſt term, and the quotient will be your anſwer, and of the ſame kind or denomination with the ſecond term.

EXAMPLES.

If 4 yards of cloth coſt 18*s.* what will 24 yards coſt?

Firſt put down 18*s.* the middle

If I lend my friend 200*l.* for 12 months, how long ought I to have the uſe of 150*l.* to requite me?

term, it being of the same name with the answer sought, thus,

—— 18*s.* ——

Now considering in your mind that 24 yards will cost more than 4 yards, then by the Rule your answer will be greater than the middle term, and therefore by the Rule the first term must be the least of the other two, thus,

yds.	*s.*	*yds.*
4 ——	18 ——	24
		18
		192
		24
		4) 432
		108 shillings,

being of the same name with the middle term, which divide by 20 to bring it into pounds,

2|0) 10|8(
£5 8 0 Answer.

If the daily difference of the Sun's declination be 12′ 33″, how much will be the proportional part for 7 hours 24 minutes?

ho.	′	″	*ho.*
24 ——	12	33 ——	7 24
60	60		60
1440	753		444
			753
			1332
			2220
			3108
			1440) 334332 (232″
			2880
			4633
			4320
6	0	23	2			3132
Anſ. 3′ 52″			2880
			252

Observe, Time being here wanted by the question, the middle term must be the 12 months given.

Next, revolving in my mind that 200 was lent for 12 months, I ought to have the use of 150*l.* a longer time, it being less money, therefore the answer will be greater than the middle term; then by the Rule, the least of the other two terms must be the first term.

l.	*mon.*	*l.*
150 ——	12 ——	200
		12
		15|0) 240|0 (16 months.
		15
		90
		90

Answer 16 months.

How many yards of cloth may be bought for 21*l.* 11*s.* 1*d.* ½, when 3 ½ yards cost 2*l.* 14*s.* 3*d.*?

l.	*s.*	*d.*	*yds.*	*l.*	*s.*	*d.*
2	14	3 —	3 ½ —	21	11	1 ½
20			4	20		
54			14	431		
12				12		
651				5173		
4				4		
2604				20694		
				14		
				82776		
				20694		
				2604) 289716(111 qrs.		
				2604		
				4)111(		2931
				—— qr. n.		2604
Anſ. 27 yds. 3 1						
				3276		
				2604		
				672		
				4		
				2688 (1		
				2604		
				84		

The proof of the Square Root is to multiply its root by itſelf, and add the remainder, if any, thus,

```
  256                 8339
  256                 8339
 ----                -----
 1536                75051
 1280               25017
  512               25017
 ----               66712
65536 Proof.       -------
                   69538921
                       4289 Remainder.
                   -------
                   69543210 Proof.
```

```
  . . .                 . . . . . .
 276854 ( 526.169      764321.097641(874.254
   25                    64
 ----                  ----
102 ) 268             167 ) 1243
    2  204                7  1169
 ----  ----           ----  ----
1046 ) 6454           1744 )  7421
    6  6276              4   6976
 ----  ----           ----  ----
10521 ) 178.00        17482 )  44509
    1   10521             2   34964
 -----  -----         -----  -----
105226 ) 727900       174845 ) 954576
    6   631356              5 ) 874205
 ------ ------         ------ ------
1052329 ) 9654400     1748504 ) 8037141
          9470961                6994016
          -------                -------
Remainder. .183439              Remainder. 1043125
```

What are the ſquare roots of the under numbers?

431649	Anſwer 657
73549.44	Anſwer 271.2
36372961	Anſwer 603.1
1.0609	Anſwer 1.03
911236798.794366	Anſwer 30186.6

The decimals above are worked the ſame as in whole numbers, obſerving there are always as many figures in the root as there are points, and as many whole numbers in the root as there are points over the whole numbers.

Note, The rules of decimal arithmetic will be ſhewn further on.

EXTRACTION OF THE CUBE ROOT.

A Cubic number is produced by multiplying any number twice into itſelf, or multiplying any number by itſelf, and the product ariſing again multiplied by that number. Thus, ſuppoſe 12, then 12 times 12 is 144, and this product 144 again multiplied by 12, produces the cube number 1728, and ſo of any other number. Then ſet down the cube of the firſt nine digits.

Roots	1	2	3	4	5	6	7	8	9
Cubes	1	8	27	64	125	216	343	512	729

from whence the neareſt cube to any period is obtained by inſpection, and

its root may be immediately placed in the quotient, as in the following Rule to extract the Cube Root.

R U L E.

1ſt. Point the given number into periods of three figures each, beginning at the unit's place, putting a point on every third figure to the left hand, and when there are decimals to the right hand alſo, counting 3 figure each way from the units place.

2d. Seek the neareſt cube to the figure or figures beneath the firſt point or period, which may conſiſt of either 1, 2, or 3 figures, and drawing a line underneath ſubtract it from the firſt period, putting the root down as a quotient figure in diviſion, and to the remainder bring down the three figures of the next point, and call it the reſolvend.

3d. Square the root or quotient, and multiply it by 300, which place for a diviſor to the reſolvend; ſeek how often it is contained therein, and place the number of times in the quotient or root.

4th. Multiply the diviſor by the number laſt found, and put it down under the reſolvend.

5th. Multiply the ſquare of this laſt figure by 30, and that product by the reſt, or all the former figures of the root, and place the ſame under the laſt product.

6th. Cube the laſt found figure, and ſet it under the laſt.

7th. Take the ſum of theſe three products from the reſolvend, and to the remainder bring down another period for a new reſolvend.

8th. Square all the figures in the root, and multiply the product by 300 for a new diviſor to this reſolvend, and proceed a before.

9th. When you have brought down every period, you may join three ciphers to the laſt remainder, and proceed as before, you will then obtain the firſt decimal figure of the root, aud for every decimal figure you want, annex three ciphers to every remainder for each new ſucceeding reſolvend. A few Examples will render this eaſy.

What is the cube root of 99252847?

```
. . .
99252847 ( 463
64
-------
4800 ) 35252 reſolvend. Then 4 times 4 16, and 300 times 16 is 4800,
-------          for a diviſor.
  28800    The quotient will be 6, then 6 times 4800 is 28800.
   4320    Then the ſquare of 6 is 36, and 30 times 36 is 1080.
             and 4 times 1080 is 4320.
    216    The cube of 6 is 216.
-------
  33336    The ſum of the three products to be ſubtracted from
-------      the reſolvend.
634800) 1916847  The remainder with the next period brought down.
-------          Then the ſquare of 46 is 2116, multiplied by 300 is
                   634800, a new diviſor.
 1904400   This diviſor gives 3, by which mult. it is 1904400.
   12420   The ſquare of 3 is 9, and 30 times 9 is is 270, and
             270 times 46 is 12420.
      27   The cube of 3 is 27.
---------
 1916847   This taken from the laſt reſolvend remains 0, there-
---------    fore the root is 463, which may be proved by
. . . . . .  multiplying it twice into itſelf.
```

What is the cube root of 27054036008?

```
   .   .   .   .
27054036008( 3002
27
```

```
2700 ) ... 54036
          54036
270000
27000000)54036008
         54000000
            36000
                8
         --------
         54036008
         --------
         ........
```

3 times 3 is 9, and 9 times 9300 is 2700 the divisor it cannot be contained in the period brought down, viz. 54, then put a cipher in the quotient, and bringing down another period for a new resolvend add two ciphers to the last divisor for a new divisor; but also this new divisor cannot be contained in this last resolvend, place another cipher in the root or quotient, and another two ciphers to the last divisor for a new divisor, and bring down another period for a new resolvend, and this new divisor will go 2 times, which put down in the root or quotient, by which multiplying the last divisor, the product is 54000000, then 2 times 2 is 4, and 30 times 4 is 120, and 300 times 120 is 36000; and lastly the cube of 2 is 8, the sum of these three last subtracted remain 0, so that the root is 3002.

What is the cube root of

```
   .   .   .
5359·375 ) 17·5
1
```

```
300 ) 4359
      2100
      1470
       343
      ----
      3913
      ----
86700 ) 446375
        433500
         12750
        ------
         46375
        ------
```

Remains nought.

What is the cube root of

```
   .   .   .   .   .
576321060.765 ( 832.1
512
```

```
19200)64321
      57600
       2160
         27
      -----
      59787
      -----
2066700)4534060
        4133400
           9960
              8
        -------
        4143368
        -------
207667200)390692765
          207667200
              24960
                  1
          ---------
          207692161
          ---------
```

Remainder 183000604

SOME USES OF THE CUBE ROOT AND CUBE.

If an iron bullet of 4 inches diameter weigh 9lb. what will one of 6 inches diameter weight?

```
4        6
4        6
--       --
16       36
4        6
--       --
64 : 9 :: 216 : 9
          9
          --
64 ) 1944 ( 30.375 Anſwer.
     192
     ---
     240
     192
     ---
      480
      448
      ---
       320
       320
       ---
       ...
```

Suppoſe an iron ſhot of 4 inches diameter to weigh 9lb. and the diameter of a ſhot of any other weight, ſuppoſe 64lb. is required?

the cube of 4 is 64,

```
lb.  lb.   lb.
then 9 : 64 :: 64
                64
                --
               256
              384
              ---
          9 ) 4096
              ---
          ) 455.111 ( 7.6
            .   .
            343
            ---
14700 ) 112111
        ------
        88200
         7560
          216
        ------
        105976
        ------
```

Anſwer 7 inches $\frac{6}{10}$ 6135

A Cooper having a caſk 40 inches long and 32 inches at the bung diameter, is ordered to make another caſk of the ſame ſhape, but to hold juſt twice as much; what will be the bung diameter and length of the new caſk?

```
40                  32
40                  32
--                  --
1600                64
 40                 96
----                --
64000 = the cube of 40,   1124
    2                     32
    .                     --
128000 twice ditto        2048
125  (50. 3 length required.
---                       3072
                          ----
7500 ( 3000               32768
       000                    2
750000-----               -----
  3000000                 65536(40.3 bung diameter
  -------                 64       required.
  225000                  ---
    13500                 1536 ( 4800
      125                 ----
  -------                 ...
  2163675                 1536000 ) 480000
  -------                 -------
   736375 Remainder.      1440000
                            10800
                               27
                          -------
                          1450827
                           85173 Reminder.
```

What

What are the cube roots of the following numbers

389017	Anſwer 73
5735339	Anſwer 179
32461759	Anſwer 319
84604519	Anſwer 439
459694072	Anſwer 638
48228544	Anſwer 364
536724.3510	Anſwer 732.61
7632154.628763	Anſwer 196.88

Of VULGAR and DECIMAL FRACTIONS.

A Fraction is a part of any thing, as one viz. one foot, one yard, one mile, &c.

A Vulgar Fraction conſiſts of two parts, the numerator and the denominator.

The denominator ſhews how many parts the whole quantity is divided into. The numerator ſhews how many of thoſe parts remain, and is always placed over the denominator, with a line drawn between them.

A Fraction is what remains after diviſion has been made, the remainder being the numerator and the diviſor the denominator; as 14 divided by 4 the quotient is 3, and 2 remains for a numerator of a fraction, of which 4 the diviſor is the denominator, and is thus expreſſed $\frac{2}{4}$ or 2 fourths.

Suppoſe 12 inches is to be divided by 5; the number of times 5 is contained in 12 is 2 and 2 remains, which remainder is the numerator and 5 the denominator of the fraction remaining, which is always a proper fraction thus $\frac{2}{5}$; wherefore $\frac{1}{2}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{4}{5}$, $\frac{9}{12}$, $\frac{5}{16}$, ſhews that ſome numbers were divided by 2, by 4, 3, 5, 12, and by 16, and that 1, 3, 2, 4, 9, 5, were their reſpective remainders after ſuch diviſions were made, and are read thus, one half, three fourths, two thirds, four fifths, nine twelfths, and five ſixteenths.

A decimal fraction is part of an unit or one, ſuppoſed to be divided into 10, 100, 1000, or 10,000, &c. equal parts. If the unit is divided into ten parts, and each of thoſe parts into ten more equal parts, &c. we obtain the foundation of decimal fractions. In vulgar fractions the numerator is ſet over the denominator, but in decimal fractions the numerator is diſtinguiſhed by a comma or point placed before it, thus ,5 ,75 ,125 is read thus, $\frac{5}{10}$, $\frac{75}{100}$, $\frac{125}{1000}$, that is, the firſt figure is 5 tenths, the ſecond 75 hundredths, and the third 125 thouſandth parts of unity or one.

A mixed number is when a fraction is annexed to a whole number, thus 27 $\frac{1}{2}$ or 27,5; 27 is the whole number, and $\frac{1}{2}$ and ,5 are the fractionel parts.

Vulgar fractions are reduced into decimal fractions or decimals by adding cyphers to the numerator, and dividing by the denominator.

Reduce $\frac{1}{4}$ of foot to a decimal.

4) 1.00

25 Anſwer.

Reduce $\frac{3}{4}$ of a mile to a decimal.

4) 3.00 (.75

28

20

20

Anſwer 75

Reduce.

Reduce 7 inches to the decimal of a foot.

12) 7.000 (.5833
60
100
96
40
36
40

Here .5833 is nearly equal to 7 inches, which may be carried much farther by adding more cyphers, but the above is sufficiently near for moſt common purpoſes.

Reduce $7\frac{1}{2}$ inches to a decimal.

$7\frac{1}{2}$
2

15 or 15 halves, of which a foot contains 24 halves

then 24) 15.0000 (.625
144
60
48
120
120
...

Reduce $\frac{1}{2}$ a yard to a decimal.

2) 1.00 (.5
10
..

here .5 is equal to $\frac{1}{2}$ a yard.

Reduce 9 inches to a decimal of a foot.

12) 9.00 (.75
84
60
60
..

here 9 inches, or $\frac{9}{12}$ of a foot, is equal to .75.

Reduce $5\frac{1}{2}$ inches to a decimal.

$5\frac{1}{2}$ inches is 11 half inches, of which the foot contains 24, or $5\frac{1}{2}$ inches is equal $\frac{11}{24}$.

24) 11.000 (4583
96
140
120
200
192
80
72
8

here .4583 is equal $5\frac{1}{2}$ inches nearly.

Reduce $5\frac{3}{4}$ inches to the decimal of a foot.

In $5\frac{3}{4}$ inches there are 23 quarters.
In 1 foot there are 48 quarters.
Then $\frac{23}{48}$ is equal $5\frac{3}{4}$ inches.

48) 23.000 (.4791
192
380
336
440
432
80
48
32

Cyphers to the right hand of a decimal fraction neither increaſe nor diminiſh their value, for .25000 is equal to .25 and .750 is equal to .75, therefore when cyphers happen to be at the end of a decimal they may be rejected.

A D.

ADDITION of DECIMALS.

Addition of decimals is performed exactly the same as in whole numbers, only observing that the place of the units in the whole numbers must be placed exactly under each other, so that the points that separate the whole numbers from the decimal parts stand in a line, and as many decimal places must be cut off from the sum as there are in the greatest numbers to be added.

EXAMPLES.

	feet.	inches.	yards.
78.8	66.71	3720.45	15836.071
34.56	148.9	25.0036	20.09
46.7	32.722	4179.802	34.07
32.53	7.81	3.6284	583.27008
154.27	40.27		
81.4	38.5	Sum 7928.8840	16473.50108
Sum 428.26	334.912		

In the above Examples, the like places in the whole numbers and in the fractional parts stand under each other, and the manner of adding them together is the same as in whole numbers.

SUBTRACTION of DECIMALS.

Subtraction of decimals is performed exactly as that of whole numbers, only taking care to place units under units, with the separating points directly under each other, thus,

From	527.634	From	405.0341
Take	148.572	Take	267.35832
Remains	379.062	Remains	137.67578
From	67.005	From	83.254376
Take	23.54673	Take	17.1857
Remains	43.45827	Remains	66.068676

MULTIPLICATION of DECIMALS.

Multiplication is performed exactly as that of whole numbers, and as many places as there are in both the multiplicand and multiplier must be cut off towards the right hand of the product, and the number standing on the left hand of the point will be whole numbers, and those on the right hand will be decimals.

Multiply	27.75 feet by 7 5	Multiply	39.25
	7.5	by	6.5
	13875		19625
	19425		23550
Product	208.125	Product	255.125
Multiply	25.96 by 9.25	Multiply	45.95
	9.25	by	20.36
	12980		27570
	5192		13785
	23364		9190
Product	240.1300	Product	935.5420

Multiply

Multiply	3.25	Multiply	.125
by	.75	by	.025
	1625		625
	2275		250
Product	2.4375		.003125

In this laſt Example, there not being ſo many places of figures as there are in both the multiplicand and multiplier taken together, I prefix 2 cyphers to make the 6th figure

THE DESCRIPTION AND USE OF THE NEW IMPROVED GUNTER'S SCALE*.

MANY have attempted to improve this uſeful inſtrument, particularly the late Mr. Robertſon, and Mr. Donn; but I think there may be ſtill further improvements made in order to render it more convenient for meaſuring all kinds of bale goods, timber, ſtone, &c.

I have thought it ſtrange, that there has not been put on the ſcale of two feet, a line with the foot divided into tenths, and thoſe tenths ſubdivided into other tenths, for the purpoſe of taking the dimenſions of any bale, box, or cheſt, &c. whoſe ſuperficial or ſolid contents is to be found, which would render the calculation extremely eaſy, without being at the trouble of finding the contents by croſs multiplication; and it were to be wiſhed, that our coins, weights and meaſures, were to undergo the ſame alteration, if that ſtubborn cuſtom, which was eſtabliſhed in the time of ignorance, could be got over.

In deſcribing the ſcale, I ſhall confine myſelf to two lines, the reſt being fully explained in the Practical Navigator, viz. the decimal line and line of numbers, which are all that are required for the purpoſe of meaſuring bales. &c.

The firſt is that line ſet on the lower part of the improved Gunter's Scale, divided into 20 equal parts reckoned from the right hand towards the left, ending at 20; the firſt 10 being 12 inches, or 1 foot; and the ſecond 10 from the middle to the end, is alſo divided into 10 equal parts, numbered 1 2, 3, 4, 5, 6, 7, 8, 9, 10, where a mark is made, then 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, making in all 24 inches, or 2 feet; each of theſe parts are again divided into 10 equal parts, making in all 200 equal parts. The larger diviſion being one tenth, and the ſmaller diviſions being 100th part of a foot or 12 inches; as the 10 in the middle ſtands for 1 foot, and the length of the ſcale two feet, it will be as eaſy to take the dimenſions by this line, as if it was divided into 24 inches.

Suppoſe a caſe, or bale, to meaſure twice the length of the ſcale, and five of the largeſt diviſions that will be 4 feet, and 5 tenths of a foot, or $4\frac{1}{2}$ feet.

Again, ſuppoſe a plank to meaſure in length 5 lengths of the ſcale, and 4 of the larger diviſions, and 5 of the ſmaller diviſions, the length will be 10,45 feet, that is, ten feet and 45 hundredths of a foot.

THE LINE OF NUMBERS MARKED NUM.

The whole length of this line, or ſcale, is divided into two equal parts; the beginning, or left hand end is marked 1, at which there is a braſs centre pin, from which the diviſions continue on 2, 3, 4, 5, 6, 7, 8, 9, and 10, at the end there is another braſs pin, both parts are alike ſubdivided into tenths.

* To be had at J. Hamilton Moore's.

Now

Now if the firſt 1 be reckoned 1 tenth, the ſecond 1 will be one, and the 10 at the end will be 10. If the firſt 1 be reckoned 1, the one in the middle muſt be reckoned 10, and the 10 at the end will be 100.

If the firſt 1 be reckoned 10, the middle one muſt be reckoned 100, and the 1 at the end muſt be taken for 1000, and all the intermediate diviſions, in each part, muſt be eſtimated according to the value ſet on the one at the beginning, or middle of the ſcale.

The primary diviſions are alſo ſubdivided into 10 parts, ſo that if the firſt 1 be reckoned 1 tenth, the next ſmaller diviſion will be 1 hundredth part of an unit; but if the firſt 1 be reckoned 1, the next ſmaller diviſion will be 1 tenth, and if the firſt be reckoned 10, the next ſmaller diviſion will be an unit between 100 and 200; the dimenſions for the tens are each ſubdivided into five parts; ſo that each of theſe leſſer diviſions ſtands for two units, the tens between 200 and 500, are divided into two parts, each ſtanding for five units; the units between the tens from 500 to 1000, are to be eſtimated by the eye, which, by a little practice, is readily done.

From the above deſcription, it will be eaſy to find the diviſion repreſenting any given number, not exceeding 1000; thus the number 62, is the ſecond ſmall diviſion from the 6; between the 6 and 7 in the firſt part, the number 435 is thus reckoned: from the 4 in the ſecond part count towards the 5 on the right hand, 3 of the leſſer diviſions and one of the ſmaller, and that will be the diviſion repreſenting 435, and the like with any other number.

The application of the whole in meaſuring boards, glaſs, ſtone, and all other kinds of packages uſually taken on board ſhips.

Note. Superficial meaſure conſiſts of length and breadth only, without any regard to depth, or thickneſs.

Solid meaſure conſiſts of length, breadth, and thickneſs.

EXAMPLES.

Required the content of a board, or plank.

ft.		*ft.*	
9·5	long and	1.25	broad
		1.25	
		9·5	
		625	
		1125	
		11,875	the content.

Required the content of a piece of glaſs.

ft.		*ft.*	
2.9	long and	1.75	broad
		2.9	
		1575	
		350	
		5,075	Anſ. the content.

Here the contents are found in feet and decimals of a foot; but if it be required to turn the decimals into inches, multiply the decimal parts by 12, and cut off as many places to the right hand, as there are decimal figures, and the figures that ſtand to the left hand of the point will be inches, Thus, in the firſt example,

The decimal parts are .875

·12

10.500

4

2.000 = 10$\frac{1}{2}$ inches.

There being 2 decimal places, therefore 3 places are cut off, and the 10 ſtanding to the left hand is 10 inches, and the remainder. 500 or 5, the two cyphers being of no value multiplied by 4 gives 2,000, and the cyphers being cut off leave 2, which is $\frac{1}{2}$ an inch, or 2 quarters, ſo that the content is 11 feet $10\frac{1}{2}$ inches.

The content may be readily found by the table of logarithms, by adding the logarithm correſponding to 9. 5 and 1. 25 together, the ſum will be the logarithm of the contents*.

1ſt Example *ft.*			2d Example		
9.5	its log.	0.97772	2.9	its log.	0.46240
1.2.5	its log.	0.09681	1.7.5	its log.	0.24304
The content 11.87	its log.	1.07453	content 5.075	its log.	0.70544

In the like manner may any dimenſions be ſquared and the contents found. If the ſolid content be required, add the logarithms of the length, breadth, and depth together, their ſum will be the logarithms of the ſolid content.

To work the two laſt Examples by ſcale and compaſſes.

1ſt, Extend from 1. to 1.25, that is, 1 and $2\frac{1}{2}$ of the ſmaller diviſions on the line of numbers, that extent will reach from 9.5, or 9 and 5 of the ſmaller diviſions to 11, and almoſt .9 on the ſame line.

2d, The extent from 1. to 1.75, or 1 and $7\frac{1}{2}$ of the ſmaller diviſions will reach from 2. 9, or 2 and 9 of the ſmaller diviſions, to 5 and about $1\frac{1}{4}$ of one of the ſmaller diviſions.

What is the ſolid content of a bale or caſe 5.7 feet long, 4.2 feet broad. 2.6 feet deep?

	ft.		*ft.*	By Logarithms.	
Length	5.7		5.7	log.	0.75587
Breadth	4.2		4.2	log.	0.62325
			2.6	log.	0.41497
	114				
	228		Content 62.25	log.	1.79409
	23.94				
	2.6		In like manner may the contents of any ſquare package be found.		
	14364				
	4788				
Solid content	62.244				

The ſame by ſcale and compaſſes.

The extent from 1 to 4.2, on the line of numbers, will reach from 5.7 to almoſt 24; and the extent from 1 to nearly 24 will reach from 2.6 to $62\frac{1}{4}$ the content; or the extent form 1 to 4.2 will reach from 2.6 to nearly 11; and the extent from 1 to 11 will reach from 5.7 to $62\frac{1}{4}$ feet.

If the meaſure is taken in feet and inches, the inches are eaſily reduced into decimals by the ſcale and compaſſes, by extending from 12 to the middle 10; that extent will reach from the given inches to the decimal part of a foot

* As the ſmallneſs of this book would not admit of a table of logarithms, that deficiency may be eaſily ſupplied by any other book in which the logarithms are.

Thus, ſuppoſe 9 inches is to be reduced to a decimal; the extent from 10 to 12 will reach from 9 to .75, the decimal equal to 9 inches by the ſame. Rule, 3 inches will be .25, and 6 inches 5, &c.

Suppoſe a plank 24.5 feet long, 2.5 broad, and .75 deep, what is the ſolid contents by decimals;

Length	24.5
Breadth	2.5
	1225
	490
	61.25
	.75
	30625
	42875
The content	45.9375

By Logarithms.

24.5	its log.	1.38917
2.5	its log.	0.39794
.75	its log.	9.87506
Content 45.94		1.66217

There place 9 for the index of the decimal .75, and reject away 10 in the ſum of the indexes; if the decimal had been .075, then the index would have been 8; and reject, and ſo on to avoid negative index.

Note. The index of any decimal fraction is eſtimated by the number of cyphers prefixed to ſhew its value, and is known by ſubtracting the number of cyphers ſo prefixed from 9 and if no cypher is prefixed to the decimal, the index is 9.

Thus the index of the decimal	.75	is 9.87506
The index of	.075	is 8.87506
The index of	.0075	is 7.87506

Here 10 is ſuppoſed to be the index of one or unity.

The diameter of a caſk at the head and bung, and alſo in length, being given to find its content in beer and wine meaſure.

RULE.

1ſt, Multiply the difference of the head and bung diameter by 0.7, and add the product to the head diameter, for a mean diameter.

2d, Multiply the ſquare of the mean diameter by the decimal .7854, to reduce it to its area.

3d, Multiply the laſt product by the length.

4th, Divide by 231 for wine gallons, and by 282 for beer gallons.

EXAMPLE.

What is the content of a cask whose head diameter is 20, the bung diameter 28, and the length 40 inches?

28
20
—
8 difference of head and bung diameter.
·7
—
5.6 number to be added to the head diameter.
20.0
—
25.6 the mean diameter.
25.6
—
1536
1280
512
—
655.36
·7854
—
262144
327680
524288
458752
—
514.719744
40 the length.
—

231) 20588.789760 (89.12 Answer for wine gallons.
...
1848
—
2108
2079
—
297
231
—
660

282) 20588.789 (73.009 Answer gallons of beer.
....
1974
—
848
846
—
2709
By log. 2538
—
171

Rule

To find the same by Logarithms.

Rule for Wine Measure.

Put down the log. of the mean diameter, twice the log. of the length, under it and the constant log. 7.53148 under the last, the sum of these 4 logs. will be the log. of the content, abating 10 in the sum of the indices.

Log. of 25.6 =	1.40824	
	1.40824	
Length 40 =	1.60206	
Constant log.	7.53148	
Log. of 89.13 gallons of wine the content.	1.95002	

Rule for Beer Measure.

Put down the log. of the mean diameter, twice the log. of the length, underneath it the constant log. 7.44484, the sum of these 4 logs. will be the beer answer in beer gallons, abating 10 in the index.

1.40824	Log. of 25.6
1.40824	
1.60206	Log. of length 40
7.44484	
1.86338 =	Answer 73 gallons of beer.

The way these two constant multiplying logarithms were found, is thus, the area of a circle whose diameter is unity, .7854 decimal parts of the square thereof; so that if the square of the diameter of any circle be multiplied by .7854, the product will be the area of the given circle; hence .7854 is always a constant quantity whose logarithm is 9.89509

2d. If the area of a circle be divided by 231, the number of cubic inches there are in a wine gallon, the quotient will be the number of gallons that circular area contains at one inch deep, hence 231 is a constant divisor, its logarithm is 2.36361, the arithmetical compliment of which is 7.63639 which I add to the former constant logarithms 9.89509

7.63639

7.53148 this sum abating 10 in the sum of the indices, is a constant logarithm to be added as per Rule for wine measure,

2d. For beer measure the divisor is always 282, its log. is 2.451015 whose arithmetical compliment is 7.54975

add 9.89509 as before

7.44584 the constant log. for beer measure as per Rule, omitting 10 in the sum of the indices, to avoid negative indices.

The common way of finding a ship tonnage at London.

Rule. Multiply the length of the keel by the breath of the beam, and that product by half the breadth of the beam, and divide the last product by 94. and the quote arising is the tonnage.

E X A M P L E.

Suppose a ship 72 feet by the keel, and 24 feet by the beam, what is the tonnage;

Length of keel	72 keel	By logarithms thus.
Breadth of beam	24 beam	Length 72 log. 1.85733
	288	Breadth 24 log. 1.38021
	144	½ Breadth 12 log. 1.07918
	1728 first product.	4.31672
½ Breadth of beam	12	94 log. 1.97313
		Tons 220.6 2.34359

94)20736(220.5 Answer.
188

193
188

560

The following are forms of two Cargo Books, generally made use of by those who take bale goods on board, and may be had, neatly engraved and covered with red leather, at John Hamilton Moore's, Tower Hill. Price *2s. 6d.*

CARGO BOOK.——FORM THE FIRST.

Date.	Marks.	No.	Qualities.	Length.	Breadth.	Depth.	Solid Contents.	Freight.	Primage.	By whom shipped.	To whom consigned.

CARGO BOOK.——FORM THE SECOND. FIRST PART.

Date.	Marks.	No.	Qualities.	Length.	Breadth.	Depth.	Solid Contents.	Date.	Marks.	No.	Qual.	Length.	Breadth.	Depth.	Solid Cont.

SECOND PART.

Marks.	No.	Qualities.	By whom shipped.	To whom consigned.	Primage.	Freight.

THE METHOD MASTERS OF SHIPS KEEP THEIR ACCOUNTS.

THE method of book-keeping is the art of placing accounts in such an eaſy manner, that the whole, or any part of the money received and advanced, may, with the greateſt clearneſs, be attained in a very little time.

Whatever is paid upon a ſhip's account, and whatever is remitted to the owners, the ſhip muſt be Dr. for it.

Whatever is received on a ſhip's account, and whatever bills are drawn upon a ſhip's account, the ſhip muſt have credit for the ſame.—It is recommended to every ſhip-maſter to keep a memorandum-book, to ſet down the money as he lays it out, both for himſelf and his ſhip; likwiſe the money which he receives, leſt at any time it ſlips his memory and be forgotten, then theſe accounts can be eaſily entered into a larger book at leiſure. By this means he can eaſily tell whether any thing has been omitted, by adding up the money paid, and taking it from the money received; if what remains is equal to the caſh he has in hand, nothing has been forgotten; if they do not agree, then it is plain ſomething has been omitted.—Many loſſes have fallen upon owners of ſhips, for want of proper care being taken by their captains in ſigning bills of lading.—When there is reaſon to ſuſpect the quantity is not right, or there is any damage in the goods, always write —(If brandy, wines, tar, &c.) contents and condition unknown; not to be accountable for leakage; and it is agreed that the freight ſhall be paid for the quantity ſhipped. John Stephenſon.—(If bars of iron, hemp or flax, &c.) quantity and conditions unknown; andone bar of iron in diſpute, if on board to be delivered.

JOHN STEPHENSON,

(If hard-ware, bales, linens, &c.)

Inſides and contents unknown to JOHN STEPHENSON.

The following Examples will be ſufficient for any voyage, to render a captain's accounts and tranſactions conciſe and pleaſant to himſelf, although they are confined to only one voyage: but if he goes to many other ports before he returns home and ſettle his accounts, they are plain enough to give him a perfect idea how to ſettle them for ſuch voyages, however long they may be, as in this voyage, money is diſburſed and received at different places.

Dr.

Dr. JAMES JAMESON, Mate on board the Frances,

1791.				l.	s.	d.
Feb. 1	To cash paid him			0	12	6
March 3	To cash at Cronstad 6 rubles					
6	To ditto	2				
10	To piece of linen	5				
17	To Cash	3				
	Rubles	16 at 4s. each		3	4	0
April 4	To two half-anchors of brandy			2	9	0
	To four pounds of tea			1	2	0
May 1	To one jacket			0	19	0
	To monthly pay to his wife paid by the owner			2	0	0
13	To balance paid in full			3	13	6
			£	14	0	0

Dr. MARTIN LILLY, Cook.

			l.	s.	d.
Feb. 4	To cash in London		1	12	0
March 1	To ditto at Cronstad		2	2	0
5	To brandy ditto		1	5	2
May 14	To balance paid in full		5	0	10
		£	10	0	0

Dr. ANTHONY BURNSIDE, Seaman.

			l.	s.	d.
Feb. 26	To brandy at the Sound		0	10	6
May 1	To cash at London		0	17	6
17	To ballance paid in full		6	17	0
		£	8	5	0

Dr. ALBERT GLADSTAINES, Seaman.

May 16	To cash paid in full		8	5	0

Dr. PHILIP LEWIS, an Apprentice.

			l.	s.	d.
Jan. 23	To a shirt and jacket		0	10	8
Feb. 24	To two pounds of tea at the Sound		0	4	4
May 13	To balance of wages		0	11	8
		£	1	6	8

With

With JOHN STEPHENSON, Cr.

		l.	s.	d.
1796.	Entered into pay the 12th of January.			
	By wages from the 12th of January, to the 12th of May, four months, at 3*l.* 10*s.* per month	14	0	0

Cr.

	By wages from the 12th of January, to the 12th of May, four months, at 50*s.* per month	10	0	0

Contra Creditor.

	By wages from the 16th of January, to the 6th of May, three months and twenty days, at 45*s.* per month — —	8	5	0

Cr.

	By wages from the 17th of January, to the 7th of May, three months and twenty days, at 2*l.* 5*s.* per month — —	8	5	0

Cr.

	By four months wages, at 4*l.* per year, from January the 13th, to May the 13th	1	6	8

Dr. CHARLES CRICKETT, Apprentice.

1796.		l.	s.	d.
Feb. 22	To cash at the Sound — —	0	10	0
May 13	To balance of four months wages at 5s. per month	0	10	0
		£1	0	0

Ship Frances. Portage Bill on a Voyage to Cronstad.

Time of Entry.	Men's Names.	Post on Board	Discharged	Time on Board.	Wages per Month. l.	s.	d.	Whole Wages. l.	s.	d.
1796.										
Jan. 2	John Stephenson	Master	May 12	Four months	6	10	0	26	0	0
	James Jameson	Mate	Ditto	Four ditto	3	10	0	14	0	0
	Martin Billy	Cook	Ditto	Four ditto	2	10	0	10	0	0
6	Anthony Burnside	Seaman	May 6	Three ditto and 20 days	2	5	0	8	5	0
7	Albert Gledstaine	Ditto	7	Three ditto and 20 days	2	5	0	8	5	0
12	Charles Cricket	Apprent.	May 12	Four ditto	0	5	0	1	0	0
	Philip Lewis	Ditto	Ditto	Four ditto	4 per year			1	6	8
								£68	16	8

Account of Disbursements for the Ship Frances, on a Voyage to Cronstad, and back, by JOHN STEPHENSON, Master. Commenced January 12, 1791.

1796.		l.	s.	d.
Jan. 13	To forty tons of ballast — —	2	10	0
	Seaman's contract — —	0	2	9
	Two handspikes — —	0	2	0
15	Oatmeal — — —	0	2	0
	Men heaving in ballast —	0	12	0
16	Smith's bill — —	1	18	2
	Sail-maker's bill — —	20	15	2
17	Mending a stove —	0	4	0
	Baker's bill — —	3	19	4
18	Butcher's bill — —	6	3	7
	Butter and sugar for sea stock —	0	17	11
20	Waterage and coffee-house expences	0	10	7
	Waterman going down the pool —	0	4	0
21	Fresh meat at Gravesend —	0	3	3
22	Clearing at ditto — —	1	0	0
	AT YARMOUTH.			
25	Greens — —	0	1	8
	Bread — —	0	2	2
	Four fowls — —	0	3	4
		£ 39	11	11

AT

AT THE SOUND.

1796.		l.	s.	d.
Feb. 17	Three pounds of tea	0	15	0
	Two half anchors of brandy for the ship's use	2	7	0
	Postage of a letter	0	1	0
26	Pilotage through the grounds	1	0	0
	Fresh meat	0	12	0
	Sugar, butter, &c.	0	5	0
	Port charges	3	18	0
	For a shore boat	0	12	0
		9	10	0

AT CRONSTAD.

		rub.	cop.
March 1	To drink-money to the pilot	1	0
	Seventy-two pounds of beef	3	0
	Two casks of beer	8	50
2	A spare top-mast	5	50
	Four bolts of sail-cloth	20	20
14	Port charges	29	0
	Harbour Master, &c.	6	0
	Deals for Dunnage	13	0
	Mats for ditto	5	0
	Commission on the freight, paid the merchant	20	0
23	Expences	25	0
	Butcher's bill	29	0
	Baker's bill	18	0
	Postage of letter	1	0
27	Pilotage out to sea	4	0
		188	20

AT LONDON.

		l.	s.	d.
May 1	Waterman coming up the pool	0	5	0
	Reporting & light money at the Custom-House	4	7	6
	Entering a protest	0	5	0
3	Heaving up the chains	0	5	0
	Meat	1	6	10
8	Transporting ship	0	7	0
	Hospital bills	0	18	0
	Chain dues	0	18	0
	Workmen unloading	0	8	0
	Waterage and expences	0	8	9
	Greens and potatoes	0	2	0
11	Surveyors clearing ship	0	7	6
		9	18	7

Dr. WILLIAM HEATHER, Owner of the Frances.

1796.		l.	s.	d.
Jan. 25	To fundry diſburſements, per account	39	11	11
Feb. 26	To ditto at the Sound ——	9	10	0
March 27	To ditto at Cronſtad, 188 rubles, 20 copecs, at 4s. per ruble ——	37	12	9
May 11	To diſburſements at London ——	9	18	7
12	Amount of the portage bill ——	68	16	8
	To a bill remitted from Cronſtad, 650 rubles, exchange at 4s. — —	130	0	0
		295	9	11

Dr. Ship Frances, Account current.

1796.		l.	s.	d.
Jan. 13	Inſurance and other charges ——	39	5	0
	Commiſſion on the freight, at 2½ per cent. for being ſhip's huſband —— ——	9	12	6
26	To diſburſements at London ——	39	11	11
Feb. 27	To ditto at the Sound — —	9	10	0
March 28	To ditto at Cronſtad — —	37	12	9
May 12	To ditto at London, homewards ——	9	18	7
	To the portage bill —— ——	68	16	8
	To balance gained — —	144	16	7
		359	4	0

	l.	s.	d.
To W. Heather, for his half gained —	72	8	3½
To Joſeph Deſſieu, for his quarter gained	36	4	2
To Henry Parry, for his eighth gained —	18	2	1
To Captain Stephenſon, for his eighth gained	18	2	0½
	144	16	7

His

His Account with JOHN STEPHENSON, Cr.

1796.		l.	s.	d.
Jan. 14	Cash received previous to my sailing	48	0	0
March 25	Freight received at Cronstad, 600 rubles, at 4s. —— ——	120	0	0
	Neat proceeds, per account of sales, 250 rubles, at 4s. — —	50	0	0
April 4	Freight to the Sound ——	1	4	0
March 4	By bill drawn upon him —	20	0	0
May 8	By cash received of him —	37	15	6
	Monthly pay to J. Jameson's wife	2	0	0
12	Balance due to me ——	16	10	5
	Errors excepted	295	9	11

London, May 13, 1796.

JOHN STEPHENSON.

Contra, Cr.

1796.		l.	s.	d.
Feb. 26	By freight to Cronstad ——	120	0	0
March	By freight to the Sound —	1	4	0
May 12	By freight from Cronstad to London, viz.			
	1000 Deals, at 3l. per hundred —	30	0	0
	98 Tons of hemp, at 2l. per ton	196	0	0
	2 Tons 16 cwt. of flax, at 2l. per ton	5	11	8
	Two thirds of the port charges —	6	8	4
		359	4	0
May 12	By balance from above gained —	144	16	7

London, May 13, 1796.

Errors excepted.

W. HAMILTON.

Invoice

Invoice of fundry Goods ſhipped on board the Ship Frances, Captain STEPHENSON, bound to Cronſtad, conſigned to the ſaid Captain, to be ſold for my Account and Riſque, viz.

			l.	s.	d.
Marked W. H.	1 Caſk 12 cheeſes	—	2	0	0
W. H.	5 Barrels of rice	—	15	8	0
1 Caſe W. H.	10 Dozen of penknives		3	12	0
	15 Yards of broad cloth		12	0	0
			33	0	0

	l.	s.	d.			
Wharfage and ſhipping —	0	14	0			
Entering at the Cuſtom-Houſe	0	5	0			
Porterage and other charges —	0	2	6			
Inſurance — —	0	13	6	1	15	0
				£34	15	0

London, January 16, 1796.

WILLIAM HAMILTON.

Account of Sales of fundry Goods, per Ship Frances, from London, ſold for Account and Riſque of Mr. WILLIAM HAMILTON, Merchant, at the ſaid Place.

Sold as follows, viz.

			Rubles.
A Goodfellow	12 Cheeſes for	—	20
George Dyer	5 Barrels of rice	—	114
Ditto	15 Yards of cloth, at 7 rubles per yard		105
James Sutherland	10 Dozen of penknives	—	48
			287 Rub.

CHARGES.

	Rub.	Cop.
Lighterage, &c. —	2	50
Cuſtom-Houſe charges —	14	15
Brokerage — —	6	0
Commiſſion, at 5 per cent.	14	35
	37	00
Neat proceeds	250	Rubles = 50l.

Cronſtad, Feb. 27, 1796.

Errors excepted.

JOHN STEPHENSON.

Manifeſt

Manifeſt of Goods on Board the Ship Frances, bound to the Sound and Cronſtad.

FOR THE SOUND.

R. 12	1 Bale for Richard King	6 rix-dollars

FOR CRONSTAD.

				Roubles
T. L. 4	1 Caſk for J. Lormitte	—		10
L. L. 1 to 5	5 Caſes, Thomas Smith	—		28
Δ 15	1 Bale, W. Wright	—		30
W.	1 Ditto, John More	—		25
O. 7 to 14	7 Barrels of Rice, J. Rea	—		15
D. 1 to 129	129 Hogſheads of tobacco		J. Rix	492
Directed	2 Trunks	—		
A. 2	1 Caſk of porter	—		
W. H.	5 Barrels of rice		myſelf	
W. H.	1 Caſk of cheeſe	—		
W. H.	1 Caſe of cloth	—		
				600

Manifeſt of Goods ſhipped on Board the Frances, JOHN STEPHENSON, Maſter, from Cronſtad to London.

1000 Deals	—	for Sutherland and Co.
98 Tons of hemp	—	
2 Tons 16 cwt. of flax		
80 Mats	—	for the ſhip's uſe.
19 Deals	—	
3 Pounds of tea	—	
2 Dozen bottles of brandy		

London, May 13, 1796.

JOHN STEPHENSON.

A Captain's Report at the Cuſtom-Houſe, England, is a Copy of the Manifeſt.

The FORM of a BILL of PARCELS for FREIGHT.

Meſſrs. SUTHERLAND and Co. London, May 25, 1796.

To the Owners of the Ship Frances, Dr. for the Freight of ſundry Goods from Cronſtad.

				l.	*s.*	*d.*
1000 Deals 3l. per hundred			—	30	0	0
98 Tons of hemp, 2l. per ton			—	196	0	0
2 Tons 16 cwt. of flax, at 2l. per ton			—	5	11	8
				231	11	8
Pilotage through the grounds	—	1	0 6			
Port charges at the Sound	—	3	0 0			
Shore boat	— —	0	12 0			
Waterman up the pool	—	0	5 0			
Reporting the light money	—	4	7 6			
Clearing the ſhip	—	0	8 0			
		9	13 0			
Two-thirds of which is			—	6	8	4
				238	0	0

LETTER OF CREDIT.

LETTERS of Credit are granted by Merchants, or others, in favour of perſons travelling into foreign parts. They are commonly unſealed, and contain an order from the writer to his correſpondent, to furniſh the bearer with a certain ſum of money, at one or ſeveral times, and to place it to the account of him who grants the letter; it is neceſſary for him who grants the letter, to give his correſpondent a letter of advice, by poſt or otherwiſe, and to deſcribe the complection, garb, or any particular mark the perſon may have who is to be honoured with credit, in order to prevent fraud, for the bearer may loſe the letter or be robbed of it, and the finder preſent it and receive ſuch monies. Letters of Credit may be of various forms; the following is one ſpecimen:

SIR,

I beg you will pay the bearer of this letter Mr. J. W.—to value of one hundred pounds, at one or more times, as he may have occaſion for it, or ſhall require the ſame of you, for which take his receipt, and this with mine of advice by poſt will be your ſufficient warrant.

London, January 11, 1796.

I am, Sir,
Your obedient Servant,

To Mr. A. G.
Merchant, Bourdeaux.

C. M.

Note. Some Letters of Credit are called general, as being directed to all perſons to whom the bearer ſhall come; but ſuch letters can only be given by perſons of very public credit.

A SEAMAN's RECEIPT.

London, May 16, 1796.

Received of Captain John Stephenſon, maſter of the Frances, of London, eight pounds five ſhillings, which is in full for wages, and all other demands, for ſervice on board the ſaid ſhip, or any other ſhip belonging to the ſame owners: witneſs my hand.

£ 8 5 0

ALBERT GLEDSTAINES.
Witneſs, JOHN M'CAUSLAND.

BILL DRAWN AT ST. PETERSBURGH.

£ 20 ſtirling. St. Peterſburgh, March 4, 1796.

Six weeks after date, pay to Mr. William Nicholſon, or his order, twenty pounds ſtirling, value received for the uſe of the Frances, and place the ſame to the account of your humble ſervant,

To Mr. WILLIAM HAMILTON,
London.

JOHN STEPHENSON.

A

CORRECT METHOD

OF

KEEPING A JOURNAL AT SEA;

RENDERED EASY TO ANY CAPACITY.

THE great End and Buſineſs of Navigation is to inſtruct the Mariner how to conduct a Ship through the wide and pathleſs Ocean to the remoteſt Parts of the World, the ſafeſt and ſhorteſt Way, in Paſſages navigable: In order to which, he muſt be able at all Times to find the Courſe and Diſtance from one Place to another; and to determine the Place of the Ship every Day; what Courſe he muſt ſteer, and how far, to gain his intended Port.

The Ship's Place at Sea, and indeed all other Places, are determined by their Latitudes and Longitudes.

The *Latitude* of any place, is its Diſtance from the Equator, counted upon an Arch of the Meridian North and South, and can never exceed 90 Degrees.

The *Equator* is that Line which divides the Earth into two equal Parts, the one North, and the other South; being 90 Degrees from each Pole.

The *Meridian* of any Place is a Line paſſing through that Place, the Equator and Poles, and divides the Earth into two equal Parts, the one Eaſt and the other Weſt; or it is that Line which the Sun comes upon when it is Twelve o'Clock. All Places that lie Eaſt or Weſt have their different Meridians; one of which is called the firſt Meridian, but variouſly placed: The Engliſh place theirs at London, the French at Paris, &c. and count the Longitude Eaſt and Weſt until they come to the oppoſite Meridian, which can never exceed 180 Degrees.

The *Difference of Latitude* is the leaſt Diſtance of the Parallels of Latitude of any two Places; ſhewing how far the one of them is to the Northward or Southward of the other.

The Difference of Latitude between any two Places, being both North or both South, is found by ſubtracting the leſs Latitude from the greater; but if one Latitude be North and the other South, their Difference is found by adding both Latitudes together.

In North Latitude ſailing Northerly, or in South Latitude ſailing Southerly, you increaſe your Latitude; but in North Latitude ſailing Southerly, or in South Latitude ſailing Northerly, you decreaſe your Latitude, becauſe you ſail nearer to the Equator from whence the Latitude is reckoned.

Wherefore in North Latitude ſailing Northerly, or in South Latitude ſailing Southerly, the Difference of Latitude added to the Latitude left, gives the

Latitude in. But in North Latitude ſaling Southerly, and in South Latitude, ſailing Northerly, the Difference of Latitude ſubtracted from the Latitude left, gives the Latitude in.

When the Latitude decreaſes, and the Difference of Latitude is greater than the Latitude ſailed from, ſubtract the Latitude left from the Difference of Latitude, and the Remainder is the Latitude in, and of a different Name; for in this Caſe it is plain that you have croſſed the Equator.

What has been ſaid, will be rendered familiar to the Learner by the following Examples.

Exam. I. What is the Difference of Latitude between London in Latitude 51° 32′N. and Rome in Latitude 41° 54′N?

	D. M.
From London's Lat.	51 32 N.
Subtract Rome's Lat.	41 54 N.
Remains Diff. of Lat.	9 38
which mult. by	60
Gives Diff. in Miles	578

Ex. II. A Ship from Latitude 29° 17′ South, ſails Southerly until her Difference of Latitude be 374 Miles, what Latitude is ſhe come to?

	D. M.
Latitude ſailed from	29 17 S.
Diff. of Lat. 374 divided by 60, is	6 14 S.
Lat. in	35 31 S.

Exam. III. Required the Difference of Latitude between Cape Finiſterre and the Cape of Good Hope?

	D. M.
Cape Finiſterre's Lat.	42 52 N.
Cape Good Hope's Lat.	34 29 S.
Diff. of Lat. —	77 21
	60
Mult. by 60 is	4641 M.

Exam. IV. A ſhip in Latitude 8° 25′ N. ſails South 600 Miles, what Latitude is ſhe in?

	D. M.
From Dif. of Lat. 600 Miles, or	10 0 S.
Subtract Lat. left	8 25 N.
The Lat. in —	1 35 S.

In the laſt Example it is plain, that as the Difference of Latitude is more than the Latitude left, the Ship muſt have croſſed the Equator, and conſequently have come into South Latitude.

Note. When one of the Places has no Latitude, or is upon the Equator, then the Lat. of the other Place is their Difference of Latitude, and is always reduced into Miles, by multiplying by 60, becauſe 60 Miles make a Degree of Latitude.

The *Longitude* of any Place is its Diſtance from the firſt Meridian, reckoned upon the Equator, in Degrees Eaſt and Weſt, until it comes to the oppoſite Meridian, and can never exceed 180 Degrees.

Difference of Longitude, is an Arch of the Equator, intercepted between the Meridian of two Places, ſhewing how far one of them is to the Eaſtward or Weſtward of the other.

The *Difference of Longitude* between two Places, being both Eaſt or both Weſt, is found by ſubtracting the leſs Longitude from the greater; but if one be in Eaſt, and the other in Weſt Longitude, the Difference is found by adding both Longitudes together.

Therefore

Therefore in East Longitude sailing Easterly, or in West Longitude sailing Westerly, the Difference of Longitude added to the Longitude left, gives the Longitude in.

But in East Longitude sailing Westerly, or in West Longitude sailing Easterly, the Difference of Longitude subtracted from the Longitude left, gives the Longitude in.

When a Ship sails East or West until she passes the opposite Meridian, or 180 Degrees, she changes her Longitude, or comes into a Longitude of a different Name: and then the Longitude made subtracted from 360 Degrees gives the Longitude in, and of a different Name with the Longitude left, as may be seen by the following Examples.

Exam. I. What is the Difference of Longitude between Cape Finisterre and Antigua?

	D. M.	
Antigua's Long.	61 45	W.
Cape Finisterre's Lon.	9 14	W.
Diff. of Long.	52 31	
	60	
Diff. in Miles	3151	

Exam. II. A Ship from Cape Charles in Long. 76° 7′ W. sails Westward until her Difference of Longitude be 400 Miles, what Longitude is she in?

	D. M.	
Cape Charles' Long.	76 7	W.
Diff. of Lon. 400 M. or	6 40	W.
Long. in ——	82 47	

Exam. III. What is the Difference of Longitude between Barcelona and Lisbon?

	D. M.	
Barcelona's Long.	2 18	E.
Lisbon's Long.	9 31	W.
Diff. of Long.	11 49	

Exam. IV. A Ship from 15° 40′ E. Long. sails Westward till her Diff. of Long. be 27° 15′, what Longitude is she in?

	D. M.	
Long. left	15 40	E.
Diff. of Long.	27 15	W.
Long. in	11 35	W.

Exam. V. What is the Difference of Longitude between Botany Bay and the N. point of St. Christopher's?

	D. M.	
Botany Bay's Long.	151 20	E.
St. Christopher's Lon.	62 42	W.
	214 2	
Exceeds 180	360	
Diff. of Long.	146 58	

Exam. VI. A Ship from Long. 160° 20′ W. sails Westward till she differs her Longitude 41° 20′, What Longitude is she in?

	D. M.	
Long. left	160 20	W.
Diff. of Long.	41 20	W.
	201 40	
	360 0	
Long. in	158 20	E.

Here it is plain that the Ship has crossed the opposite Meridian, and therefore has come into a Longitude of a different Name.

In sailing due North or South, the Ship changes her Latitude only, and sailing due East or West her Longitude; but sailing upon any other Course, she must change both Latitude and Longitude.

Ships at Sea are directed from one Place to another by Means of an Inſtrument called the Mariner's Compaſs.

The Mariner's Compaſs is an Artificial Repreſentation of the Horizon of every Place by the Means of a circular Piece of Paper, called a Card, divided like the Horizon into Degrees and Points, which are called Rhumbs. This Card being properly fixed to a Piece of Steel, called the Needle, that has been touched with a Loadſtone, all the Points of the Card will be directed towards the correſponding Point of the Horizon.

Hence it follows, that in every Place the North Point of the Card ſhews the Poſition of the Meridian at that Place, and ſome one Rhumb or Point of the Card will coincide with, or be directed along the Track that makes any given Angle with the Meridian; conſequently, by the Help of the Card or Compaſs, a Ship may be kept in any propoſed Track or Courſe.

A Rhumb Line, or Point, is a Right Line drawn from the Center of the Compaſs to the Horizon, and is named from that Point of the Horizon it falls in with.

The Courſe is the Angle which any Rhumb Line makes with the Meridian, and is ſometimes reckoned in Degrees, and ſometimes in Points of the Compaſs; ſo that if a Ship ſails upon the ſecond Rhumb or N. N. E. the Courſe is 22 Degrees 30 Minutes: And ſo for any other, as in the following Table, which the Learner ſhould be ſo well acquainted with, or the Compaſs, as to be able readily to tell how many Points any Courſes or Rhumbs are diſtant from the Meridian, or from the Parallel.

THE MARINER's COMPASS.

A Table of the Angles which every Point and Quarter Point of the Compass makes with the Meridian.

Points.	D. M.	Points.	D. M.	Points.	D. M.	Points.	D. M.
¼	2.49	2 ¼	25 19	4 ¼	47.49	6 ¼	70.19
½	5.37	2 ½	28. 7	4 ½	50.37	6 ½	73. 7
¾	8.26	2 ¾	30.56	4 ¾	53.26	6 ¾	75.56
1	11.15	3	33.45	5	56.15	7	78.45
1 ¼	14. 4	3 ¼	36.34	5 ¼	59. 4	7 ¼	81.34
1 ½	16.52	3 ½	39 22	5 ½	61.52	7 ½	84.22
1 ¾	19.41	3 ¾	42.11	5 ¾	64.42	7 ¾	87.11
2	22.30	4	45. 0	6	67.30	8	90. 0

The

The Uſe of the Tables of Difference of Latitude and Departure in working any of the Caſes in

PLANE SAILING.

PLANE SAILING is the Art of Navigating a Ship upon Principles deduced from the Notion of the Earth's being an extended Plane, which may anſwer very well in ſhort Voyages near the Equator, and admits of ſix Caſes, which we ſhall work by the Tables of Difference of Latitude and Departure.

Note. Eaſting or Weſting in Plain Sailing is called Departure; Northing and Southing, Difference of Latitude; and the Point or Rhumb the Ships ſails upon, is called the Diſtance. The Angle which that Point makes with the Meridian, is called her Courſe: and what that wants of 90 Degrees or 8 Points is called the Complement of the Courſe; conſequently, the Courſe and Complement of the Courſe is always 8 Points, or 90 Degrees; ſo that ſubtracting the Courſe from 8 Points, or 90 Degrees, leaves the Complement of the Courſe.

In theſe Tables, the Courſe, if leſs than 4 Points or 45 Degrees, will be found at the Top of the Tables; but if it be more than 4 Points or 45 Degrees, it will be found at the Bottom of the Tables; and in every Page there are five Columns for Diſtances, marked Diſt. which contains 60 Miles in each Column, the firſt beginning at 1, and ending at 60; the ſecond beginning at 61 and ending at 120; and ſo on to 300 Miles Diſtance; and to each of theſe Columns of Diſtance there belongs two other Columns, ſhewing the Difference of Latitude and Departure to any of thoſe Diſtances; marked Lat. and Dep. in which you are to obſerve, that if your Courſe be found at the Top of the Tables, then you are to take out the Difference of Latitude and Departure, as they are marked at the Top; but if your Courſe be found at the Bottom, then you are to take them as they are marked at Bottom.

When the Courſe is given in Points or Quarter Points, you muſt make uſe of the Table of Difference of Latitude and Departure, calculated for Points, &c. but when it is given in Degrees, or where it is not given at all, you muſt make uſe of the Table of Difference of Latitude and Departure, calculated for Degrees: or ſearch in both Tables until you finda Difference of Latitude

Latitude and Departure nearly corresponding with your Difference of Latitude and Departure given; or with the Difference of Latitude or Departure and Diſtance given; and then the Courſe will be found in its proper Column, either at the Top or Bottom.

CASE I.

Courſe and Diſtance given, to find the Difference of Latitude and Departure.

EXAMPLE.

A Ship ſails N. N. E. 241 Miles, I demand her Difference of Latitude and Departure?

Rule. Find the Courſe among the Points or Degrees, either at the Top or Bottom, and find the Diſtance in its Column; oppoſite to which will be found the Difference of Latitude and Departure in their Columns.

Thus having found the Courſe, which is two Points, in the Table for Points, I find my Diſtance 241 in the Column for Diſtances, and right againſt that I find 222,7-Tenths for my Difference of Latitude, and 92,2-Tenths for my Departure.

Note. In all Caſes, if the given Side or Sides be in Miles, or Miles and Tenth of a Mile, then the Sides found by the Tables will alſo be in Miles; but if in Leagues, then the Side or Sides found will alſo be in Leagues.

CASE II.

Courſe and Difference of Latitude given, to find the Diſtance run and Departure from the Meridian.

EXAMPLE.

If a ſhip ſails S. 48 Degrees Weſt, till her Difference of Latitude be 79 Leagues, I demand her Diſtance and Departure?

Rule. Find the given Courſe at the Top or Bottom of the Tables, either among the Points or Degrees; and in that Page, and right againſt the Difference of Latitude, taken in its Column, ſtand the Diſtance and Departure in their Columns.

Thus, the Courſe is 48 Degrees, which I find at the Bottom of the Table of Difference of Latitude and Departure for Degrees; and in the Column marked with Latitude at the Bottom, I look for my Difference of Latitude 79, the neareſt to which is 78,9 Tenths, oppoſite to which ſtand 118 in the Diſtance Column, and 87,7-Tenths in the Departure Column, which is the Diſtance and Departure required.

CASE III.

Courſe and Departure given, to find the Diſtance and Difference of Latitude.

EXAMPLE.

If a Ship ſails N. E. by E. $\frac{3}{4}$ E. from a Port in 3 Degrees 15 Minutes South Latitude, until ſhe departs from her firſt Meridian 412 Miles, what is her Diſtance ſailed, and Latitude in?

Rule. Find your Courſe, which is 5 $\frac{3}{4}$ Points as before: then look in ſome of the Departure Columns belonging to that Courſe for your Departure, or the neareſt thereto; the Diſtance and Difference of Latitude anſwering to that Departure will be found in their reſpective Columns.

But in any Caſe, where the given Side is too large to be found in the Tables, divide it by 2, 3, 4, or any other convenient Number, that will make it ſmall enough to be found in the Tables; and then the required Sides,

Sides, when found, muſt be multiplied by the ſame Number; but the Courſe muſt never be multiplied or divided.

Thus N. E. by E. $\frac{3}{4}$ E. being 5 $\frac{3}{4}$ Points, which I find at the Bottom of the Page; and then look into the Departure Column for Half my Departure 206, (the Whole being too large to be found in the Tables) and find 228 for the Diſtance, and 97, 5-Tenths for the Difference of Latitude, which being doubled, gives the Diſtance 456, and the Difference of Latitude 195.

Now, ſince the Ship has ſailed from a South Latitude Northerly,

	D.	M.	
From the Latitude ſailed from	3	15	S
Subtract the Difference of Lat. 195 Miles, or	3	15	N.
	0	0	

The Difference being nothing, ſhews that the Ship is upon the Equator.

CASE IV.

Diſtance and Difference of Latitude given, to find the Courſe and Departure.

EXAMPLE.

Suppoſe a Ship ſails between the North and Weſt until her Diſtance be 276 Miles, and her Difference of Latitude be 211,4, what is her Courſe and Departure?

Rule. Seek in the Tables, till againſt the Diſtance taken in its Column be found the given Difference of Latitude in one of the following Columns, and adjoining to it ſtands the Departure, which, if leſs than the Difference of Latitude, the Courſe is found at the Top of the Column; but if greater, the Courſe is found at the Bottom.

Now taking the Diſtance, I ſeek till againſt Diſtance 276 ſtands 211,4, which I find ſtanding together under 40 Degrees; oppoſite to which ſtands 177,4, and as my Difference of Latitude is more than my Departure, I find my Courſe at the Top, which is 40 Degrees. Now to reduce this Courſe into Points, I look into the Table following the Compaſs for the neareſt to it, which is 39° 22′; oppoſite to that ſtands 3 $\frac{1}{2}$ Points; and as my Courſe is between the North and Weſt, I ſet down N. W. by N. $\frac{1}{2}$ W. which is my Courſe nearly.

CASE V.

Diſtance and Departure given, to find the Courſe and Difference of Latitude.

EXAMPLE.

From Latitude 50° 13′N. a Ship, in ſailing between the South and Eaſt 98 Miles, makes her Departure 82 Miles; what Courſe did ſhe ſteer, and what Latitude is ſhe in?

Rule. Seek in the Tables, till againſt the Diſtance taken in its Column be found the given Departure in one of the following Columns; and adjoining to it ſtands the Difference of Latitude; which, if greater than the Departure, the Courſe is found at the Top of the Column; but if leſs, the Courſe is found at the Bottom.

Now ſeeking till againſt the Diſtance 98 ſtands 82, the neareſt will be 82,2, ſigned Departure at the Bottom; and here the Difference of Latitude is 53,4, and the Courſe is 57 Degrees: But wiſhing to find them ſtill nearer, I turn to the Table of Points, and there againſt Diſtance 98 ſtands 81,5,

and 54,4; and as 81,5 is found in the Column ſigned Departure at Bottom, I there find my Courſe to be 5 Points; therefore, ſince the Ship has ſailed between the South and E. I take S. 57° E. or S. E. by E. for my Courſe.

Now, from the Latitude ſailed from 50° 13′, take the Difference of Latitude 54, becauſe ſailing Southerly, and there remains 49° 19′, the Latitude in. *Note.* When the Tenths are under 5, they are generally omitted; but if above 5, one is allowed for them.

CASE VI.

Difference of Latitude and Departure here given, to find the direct Courſe and Diſtance.

EXAMPLE.

A Ship in Latitude 40° 10′ North, is bound to a Port in Latitude 41° 2′ N. the Departure between the two Places is 33 Miles Eaſt; I demand upon what Courſe ſhe muſt ſail, and how far, to gain her intended Port?

	D. M.
From the Latitude the Ship is bound to	41 2 N.
Subtract the Latitude the Ship ſails from	40 10 N.
	0 52 Miles.

Seek in the Tables till the given Difference of Latitude and Departure are found together in their reſpective Columns; then right againſt them will be found the Diſtance in its Column; and the Courſe ſtands among the Degrees or Points at the Top or Bottom of the Column where the Difference of Latitude and Departure were found.

Now taking the Difference of Latitude 52, and Departure 33, I find that the Numbers ſtanding together neareſt to theſe are 52,6 and 32,9; and the Diſtance anſwering to theſe is 62, and as my Difference of Latitude is greateſt, I find 32 Degrees at the Top for my Courſe; and ſince the Ship ſails between the North and Eaſt, the Courſe is N. 32° E. or N. E. by N. neareſt, Diſtance 62 Miles.

Having learned theſe neceſſary Caſes concerning a ſingle Courſe, the next is a compound Courſe, commonly called a *Traverſe.*

A *Traverſe* is when a Ship, meeting with contrary Winds, ſails upon ſeveral Courſes.

To reſolve a Traverſe, is to reduce or bring the ſeveral Courſes into one; the Courſes are known by the Compaſs; and the Diſtances by the Log; which in common Voyages, is heaved once in two Hours; but in Ships of War, or ſailing to the Eaſt-Indies, every Hour.

In the Steerage, or ſome convenient Place in the Ship, there generally hangs a Table, called the *Log-Board*, divided into Seven Columns. In the Firſt are written the Hours of the Day. In the Second, the Knots the Ship runs during Half a Minute; each of theſe Knots bears the ſame Proportion to a Sea Mile that Half a Minute does to an Hour; conſequently, ſo many Knots the Ship runs in Half a Minute ſo many Miles ſhe runs in an Hour. In the Third, the Fathoms; Ten of which ought to make a Knot. In the Fourth, the Courſes ſteered by the Compaſs. In the Fifth, the Winds. In the Sixth the Lee-way. And in the Seventh, the Tranſactions of the Day, as in the following Table. Every Day at Noon the Log-Board is tranſcribed into the Log-Book, which is divided into Columns, exactly like the Log-Board; and the ſeveral Courſes being corrected for the Lee-way and Variation, and the Diſtance run upon each Courſe being ſet down in the Traverſe Table, ſhews what Difference of Latitude and Departure the Ship has made during the laſt 24 Hours; and from thence is found the Latitude and Longitude the Ship is in. The Operation is called Doing a Day's Work.

The LOG BOARD.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Tranſactions.
2	6		S. W. by S.	N.		
4	5	5				
6	5			N. W.		
8	5					
10	4	5	N. E.	N. N. W.		Moderate Gales and Cloudy Weather; at 8 A. M. ſaw ſeveral Ships to the Weſtward.
12	4	5				
2	4	5				
4	4	5				
6	4	5				
8	5		S. W. by S.	W. N. W.		
10	4	5				
12	4					

Having placed the Courſes and Diſtance run upon each, I begin with the firſt Courſe, S. W. by S. which is 3 Points, and the Diſtance run upon it being ſummed up, is 21,5, or an Half; which being doubled (becauſe the Log was hove every two Hours) is 43. In like Manner proceed with the other Courſes, and then find the Difference of Latitude and Departure for each Courſe and Diſtance.

When the Courſe is to the Southward, the Difference of Latitude, when found, muſt be ſet in the Column marked S. or South; but if to the Northward, in that marked N. or North; likewiſe when the Courſe is to the Eaſtward, the Departure muſt be ſet in the Column marked E. or Eaſt; but if to the Weſtward, in that marked W. or Weſt. Thus the firſt Courſe being S. W. by S. the Difference of Latitude belonging to it is ſet under S. and Departure under W. as in the following Table:

The TRAVERSE TABLE.

Courſes.	Diſt.	N.	S.	E.	W.
S. W. by S.	43		35.8		23.9
N. by E.	45	31.8		31.8	
S. W. by S.	27		22.4		15.0
		31.8	58.2		38.9
			31.8	31.8	31.8
	Diff. of Lat. S.		26.4	Dep. W.	7.1

Here the Weſtings being greater than the Eaſtings, the Difference ſhews how far the Ship has got to the Weſtward; and the Southings being greater than the Northings, ſhew how far the Ship has got to the Southward of the Place ſh ſet out from.

EXAMPLE.

EXAMPLE.

A Ship from the Lizard in Latitude 49° 57′N. is bound to a Port in Latitude 51° 49′N. whoſe Departure from the Lizard is 162 Miles Weſt, ſteers the following Courſes as per Log, viz. S. S. W. 54 Miles; W. by S. 39 Miles; N. W. by N. 40 Miles; N. E. by E. 69 Miles; N. N. W. 60 Miles.

Required the direct Courſe and Diſtance made good upon theſe ſeveral Courſes; the Latitude the Ship is in, and what Courſe ſhe muſt ſteer, and how far, to gain her intended Port?

I begin with the firſt Courſe, S. S. W. or Points, under which, in the Tables, and oppoſite to the Diſtance 54 Miles, ſtands 49,9 for my Difference of Latitude, and 20,7 for my Departure; and as the Courſe is between South and Weſt, I ſet the Difference of Latitude in the Column marked S. and the Departure in the Column marked W. In like manner I proceed with each Courſe and Diſtance; which being found as above, will ſtand as in the following Traverſe Table:

Courſe.	Diſt.	N.	S.	E.	W.
S. S. W.	54		49,9		20,7
W. by S.	39		7,6		38,2
N. W. by N.	40	33,3			22,2
N. E. by E.	69	38,3		57,4	
N. N. W.	60	55,4			23,0
		127,0	57,5	57,4	104,1
		57,5			57,4
Diff. of Lat. Northerly		69,5	Dep. Weſterly		46,7

Having placed them as above, I add up all the Northings, Southings, Eaſtings, and Weſtings, ſeparately, and ſet down their reſpective Sums at the Bottom of each Column; and as the Weſtings are greater than the Eaſtings, I ſubtract the one from the other, and the Difference, 46,7, ſhews that the Ship has departed ſo much Weſt of her firſt place.

Again, the Northings being greater than the Southings, I ſubtract the Leſs from the Greater, and the Remainder, 69,5, ſhews how far the Ship is Northward of her firſt place.

Now having the Difference of Latitude 69,5, and the Departure 46,7, made good upon the ſeveral Courſes, I ſeek in the Tables until they are found ſtanding together in their reſpective Columns, the neareſt to which is 69,6, and 47, ſtanding together under 34 Degrees; and againſt them ſtands 84 for the Diſtance. Hence the Courſe made good upon the ſeveral Courſes, is N. 34 Degrees W. or N. W. by N. nearly, and Diſtance 84 Miles.

To find the direct Courſe and Diſtance to the intended Port.

To the Latitude left 49° 57′ N. add the Difference of Latitude made 69, or 1 Degree 9 Minutes, gives 51° 6′ N. the Latitude in.

	D. M.		
From the Lat. of the intended Port	51 49 N.	Departure between the Ports	162,0 W.
Subtract Lat. in	51 6 N.	Sub. Dep. made	46,7 W.
Diff. of Lat. between Ship and Port.	43	Dep. between Ship and Port	115,3 W.

With

With Difference of Latitude 43, and Departure 115,3, I ſeek in the Tables till they are found ſtanding together in their reſpective Columns; the neareſt to which I find ſtanding over 69 and 70 Degrees, which, being added together, is 139°; Half that Sum is 69° 30′; the Courſe, and Half the Diſtances belonging to theſe Courſes, is 123 Miles.

Hence the direct Courſe from the Ship to her intended Port is N. 69° 30′ W. or nearly W. N. W. $\frac{1}{4}$ W. Diſtance 123 Miles.

Another Example to exerciſe Traverſe Sailing.

A Ship in the Latitude 17° 10′ N. is bound to a Port in the Latitude of 13° 10′ N. the Departure being 180 Miles Weſtward, ſails theſe Courſes: S. W. by W. 27 Miles; W. S. W. $\frac{1}{2}$ W. 30 M. W. by S. 25 M. W. by N. 18 M. S. S. E. 32 M. S. S. E. $\frac{3}{4}$ E. 27 M. S. by E. 25 M. S. 31 M. S. S. E. 39 Miles.

Required her preſent Latitude, and the direct Courſe and Diſtance to the deſired Port?

Anſwer. The preſent Latitude is 14° 21′ N. Courſe S. 62° W. or S. W. by W. $\frac{1}{2}$ W. and Diſtance 150 Miles.

The Uſe of the Tables of Difference of Latitude and Departure in working the moſt uſeful Caſes in MERCATOR'S *and* MIDDLE LATITUDE SAILING.

IN PLANE SAILING the Earth was conſidered as a Plane, repreſenting a Bowling Green, having the Meridians parallel to each other, and, conſequently, the Degrees of Longitude equal in all Places; but this cannot be true, as the Earth is a Sphere or Globe: For,

As the Meridians are great Circles on the Globes, croſſing the Equator, and meeting at the Poles, it is plain that any two of theſe Circles muſt be farther aſunder the farther they are from the Poles; and the greateſt Diſtance between them will be upon the Equator, which is equally diſtant from each Pole, and there the Diſtance is 60 Miles; but in the Latitude of 60° North or South, the Diſtance is no more that 30 Miles.

The true Place of a Ship at Sea depends upon its Latitude and Diſtance from ſome noted Meridian; and ſince the Meridian Diſtance, that is, the Diſtance between two Meridians, varies in every Latitude, it is therefore neceſſary that this Diſtance ſhould be reckoned in ſome fixed Latitude, and where the Degrees are of the ſame Magnitude, which can be no where but upon the Equator.

Now, in order to turn this Meridional Diſtance, or Departure, into Longitude, and be able to aſcertain the Ship's Place at Sea, we muſt have Recourſe to Middle Latitude, or Mercator's Sailing, where the Earth is conſidered as a Globe. The principal Caſes are as follow:

Note. In working all Caſes in *Mercator's Sailing*, we muſt make Uſe of the Table of Meridional Parts, which are Numbers, ſhewing how far each Degree and Minute of Lat. is enlarged, ſo as to keep a due Proportion with the Decreaſing of the Degrees of Long. in every Lat. Therefore, to find the Meridional, or an enlarged Difference of Latitude, between any two Places; firſt, in the Table of Latitude and Longitude, find the Latitudes of the given Places; with which ſeek for the Degrees on the upper Part of the Table marked D, for Degrees; and in the right or left Hand Columns, for the Minutes, marked at the Top with M. oppoſite to which, and under the Degrees, are the Meridional Parts; and then add, or ſubtract, as the Caſe requires.

Thus,

Thus, suppose the Meridional Parts belonging to the Latitude of Cape Clear in Ireland were required? First, find the Latitude of Cape Clear, which is 51° 18′ N. then, in the Table of Meridional Parts, seek 51° at the Top, and 12′ in the Side Columns; opposite to that, and under 51°, stands 3588, the Meridional Parts required. The same may be observed of any Number of Degrees and Minutes required.

To exhibit, at one View, these different Kinds of Sailing, I shall shew how to work the following Cases, by Mercator's and Middle Latitude Sailing, in opposite Columns in the same Page; leaving the Mariner to chuse which of them he thinks proper to find his Difference of Longitude by.

CASE I.

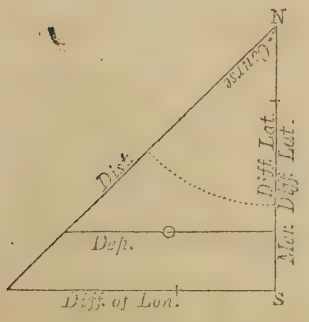
The Latitudes and Longitudes of two Places given, to find the direct Course and Distance between them.

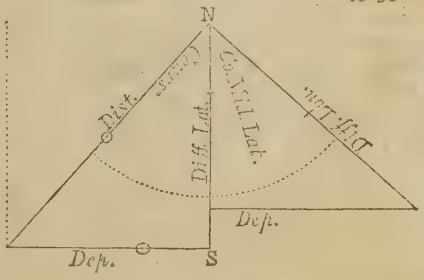
EXAMPLE.

What is the Course and Distance between Cape Clear, in Ireland, and St. Mary's, one of the Azores?

	D.	M.			
Cape Clear's Lat.	51	15N.	Mer. Parts	3593	
St. Mary's Lat.	37	0N.	Mer. Parts	2393	
Diff. of Lat.	14	15	Mer. Dif. of Lat.	1200	
	60				
Diff. of Lat. in Miles	855				

	D.	M.			D.	M.
Longitude	9	50W.	Latitude	51	15N.	
Longitude	25	6W.	Latitude	37	0N.	
Dif. of Lo.	15	16	Sun's Lat.	88	15	
	60					
			Mid. Lat.	44	7	
Dif. in Mi.	916			90	0	
			Com. Mid. Lat.	45	53	





The Difference of Longitude to be worked as Departure.

The Complement of Mid. Latit. to be worked as a Course, and the Diff. of Long. as Distance.

By Mercator's Sailing.

By viewing the Figure it will evidently appear, that by enlarging the Difference of Latitude, the Difference of Longitude will bear the same Proportion to the Meridional Difference of Latitude, that the proper Difference of Latitude bears to the Departure, and the Course continues the same.

By Middle Latitude Sailing.

Difference of Longitude is reduced into Departure, by adding both Latitudes together as above, and taking Half their Sum for a Mean or Middle Latitude; this Middle Latitude subtracted from 90 Degrees, gives the Complement of Middle Latitude; with this Complement taken as a Course, and the Difference of

Therefore, ſeek the Meridional Difference of Latitude and Difference of Longitude together, as if they were really proper Difference of Latitude and Departure, and the Courſe will be found among the Points or Degrees, as in Caſe VI. in Plane Sailing.

Then with the Courſe and proper Difference of Latitude, find the Diſtance:

Thus, taking the one Tenth of 1200, the Meridional Difference of Latitude, and 916, the Difference of Longitude, viz. 120 and 91,6, the neareſt Numbers to theſe ſtanding together in the Tables, are 120,6 and 90,9 under 37 Degrees, which is my Courſe.

Then with the Courſe 37°, and one Fourth of 855 the proper Dif. of Lat. 213,7 I find the neareſt Number to this is 214, ſtanding in Lat. Column, the Diſtance to which is 268, and being multiplied by 4, becauſe the Difference of Latitude was divided by 4, gives the Diſtance 1072.

Hence the direct Courſe is S. 37° W. or nearly S. W. by S. $\frac{1}{4}$ W. Diſtance 1072 Miles.

By Logarithms the Courſe is 37° 22′, and Diſt. 1076 Miles.

of Longitude as Diſtance, find the Departure as in Caſe I. in Plane Sailing.

Having the Departure and the proper Difference of Latitude, the Courſe is found as in Caſe VI. in Plane Sailing.

Thus, taking the Complement of Middle Latitude 45° 53′, or 46 Degrees, as a Courſe, and one Fourth of my Difference of Longitude 916 =229, as Diſtance, the Departure anſwering to theſe is 164,7, which multiplied by 4, gives 658,8, the Departure; then with one Fourth of the proper Dif. of Latitude 855, and Departure 658,8, viz. 213,7, and 164,7, I ſeek in the Tables, and find the neareſt Numbers to theſe ſtanding together are 213,5, and 166,9, under 38 Degrees, againſt which, in the Diſtance Column, ſtands 271, this being multiplied by 4, gives 1084.

Hence the direct Courſe is S. 38° W. or nearly S. W. by S. $\frac{1}{4}$ W. Diſtance 1084 Miles.

By Logarithms, the Courſe is 37° 34′, and Diſtance 1077,5 Miles.

CASE II.

The Courſe and Difference of Latitude given, to find the Diſtance and Difference of Longitude.

EXAMPLE I.

A Ship ſails from the Lizard, and makes her Courſe S. 39° W. or nearly S. W. by S. $\frac{1}{2}$ W. and then by Obſervation is in Latitude 45° 31′ N. Required her Diſtance and Difference of Longitude?

By Mercator's Sailing.

	D. M.	
Lizard's Lat.	49 57 N. Mer. Parts	3470
Lat. in	45 41 N. Mer. Parts	4074
Diff. of Lat.	4 26 Mer. Diff. of Lat.	467
	60	
Diff. in Miles	266	

Rule. With the Courſe among the Degrees, and the Difference of Latitude, found in the Column of Lat. find the Diſtance in its Column.

By Middle Latitude Sailing.

	D. M.
Lizard's Lat.	49 57 N.
Lat. in	44 31 N.
Sum Latitudes	2)95 28
Middle Lat.	47 44
	90 00
Com. Mid. Lat.	42 16

Rule. With the Courſe and proper Diff. of Lat. find the Diſt. and Departure in their Columns; then look for

With the Courſe among the Degrees, and the Merid. Diff. of Latitude in the Lat. Column, the Difference of Longitude will be found in the Departure Column.

Thus, under the Courſe 31 Degrees, and againſt Half the Diff. of Lat. 133, ſtands 171 in the Diſtance Column, that doubled gives 342, the Diſtance. Under the ſame Degrees, I look in the Lat. Column for Half my Meridional Difference of Latitude 198, againſt that in the Column of Departure ſtands 160,5, doubled is 321, the Difference of Longitude.

	D.	M.	
Lizard's Long.	5	14	W.
Diff. of Long. 321, or	5	21	W.
Long. in	10	35	W.

for the Com. of Mid. Lat. among the Degrees, as if it was a Courſe, and your Departure in its Column, oppoſite to which, in the Diſt. Column, will be the Difference of Longitude.

Thus, under the Courſe 32°, and againſt Half my Diff. of Lat. 133, in its Column, ſtand Diſt. 171, and Dep. 107.7; theſe being doubled, give 342 for the Diſt. and 215.2 the Departure; then in the Dep. Column, under 42°, the Com. of Mid. Lat. I look for Half my Departure, the neareſt is 107.6; oppoſite to this in the Diſt. Column, ſtands 161, which, being doubled, gives 322, the Diff. of Longitude, nearly the ſame as before.

	D.	M.	
Longitude left	5	14	W.
Diff. of Long. 322, or	5	22	W.
Long. in	10	36	W.

CASE III.

The Courſe and Diſtance given, to find the Difference of Latitude and Difference of Longitude.

EXAMPLE.

A Ship in Latitude 42° 30′ N. and Longitude 18° 31′ W. ſails S. W. by S. 591 Miles. What Latitude and Longitude is ſhe in?

By Mercator's Sailing.

Rule. With the Courſe found in the Table for Points, and Diſt. find the Difference of Latitude, and Latitude in, and Meridional Difference of Latitude; with the Courſe, and Meridional Difference of Latitude, taken in the Column of Latitude, the correſponding Departure will be the Difference of Longitude.

Thus under the Courſe 3 Points, and againſt one-Tenth of the Diſtance 59, in the Latitude Column, ſtands 49,1, this multiplied by 10, is 491, the Difference of Latitude. Then,

Lat. left	42 30 N.	Mer. Parts 2822
Diff. 491, or	8 11 S.	
Lat. in	34 19 N.	Mer. Parts 2194
		Mer. Diff. of Lat. 628

Now with one Fourth of this Meridional Difference of Latitude 157,

By Middle Latitude Sailing.

Rule. With the Courſe found among the Points, and Diſtance, find the Diff. of Lat. and Dep. then find the Lat. in, and Com. of Mid. Lat. in the Table for Degrees, and the Dep. in its Column, and the correſponding Diſtance will be the Difference of Longitude.

Thus, under the Courſe 3 Points, and againſt one-Tenth of the Diſtance 59,1, ſtands Diff. of Lat. 49,1, and Dep. 32,8, theſe being multiplied by 10, gives the Difference of Latitude 491, and Departure 328. Then,

Lat. left	42 30 N.	
Diff. of Lat 491, or	8 11 S.	
Lat. in	34 19 N.	
Sum of Latitudes	2) 76 49	
Mid. Lat.	38 24	
	90 00	
Com. Mid. Lat.	51 36	

found in the Column of Latitude for 3 Points, the Departure corresponding to it, is 105, which being multiplied by 4, is 420, the Difference of Longitude.

	D. M.	
Long. left	18 31	W.
Diff of Long. 420, or	7 0	W.
Long. in	25 31	W.

Note. There being no Tenths in the Diſtances, the neareſt Number is here taken.

Now with Half the Dep. 164, I ſeek the neareſt Dep. to this over 51° and 52°, becauſe the Com. of Mid. Lat. is between 51° and 52°, the neareſt to which are 164 and 163,9, the Diſtances correſponding to theſe are 211 and 208, which being added together, gives 419, the Diff. Lon.

Long. left	18 31	W.
Diff. of Long. 419, or	6 59	W.
Long. in	25 30	W.

CASE IV.

Difference of Latitude and Departure given, to find the Courſe, Diſtance, and Difference of Longitude.

EXAMPLE.

A Ship in Latitude 49° 57′ N. and Long. 5° 14′ W. ſails S. Weſterly till her Departure from the Meridian be 789 Miles, and is then found by Obſervation to be in Lat. 39° 20′ N. Required the Courſe ſteered, Diſtance ſailed, and the Longitude ſhe is in?

By Mercator's Sailing.

Lat. left	49 57 N.	Mer. Parts	3470
Lat. by Obſ.	39 20 N.	Mer. Parts	2571
Diff. of Lat.	10 37	Mer. Diff. Lat.	899
	60		
Diff. in Miles	637		

Rule. The Diff. of Lat. and Dep. being found ſtanding together, give the Courſe among the Degrees, and the Diſt. in its Column. In the Lat. Column belonging to the Degrees of the Courſe, find the Merid. Diff. of Lat. oppoſite to that, in the Departure Column, will be the Difference of Longitude.

Now a ſixth Part of Diff. of Lat. 637, and of the Dep. 789, are 106,1 and 131,5; the neareſt to theſe are found over 51°, and the Diſtance 169, being multiplied by 6, is 1014 Miles.

In the Lat. Column, over the ſame Degrees, look for a 6th of the Mer. Diff. of Lat. 899, viz. 149,8; againſt that, in the Dep. Column, ſtands 185, which multiplied by 6, is 1110 Miles, the Diff. of Longitude required.

By Middle Latitude Sailing.

Lat. left	49 57 N.
Lat. by Obſ.	39 20
Sum	2) 89 17
Mid. Lat.	44 38
	90 00
Com. Mid. Lat.	45 22

Rule. The Differ. of Latitude and Depar. being found together, will give the Courſe among the Degrees, and the Diſt. and Departure in their Columns.

With the Com. of Middle Lat. among the Degrees, and the Dep. in its Column, find the Diff. of Long. among the Diſtances.

Now a Sixth of the Diff. of Lat. 637, and of the Dep. 789, are 106,1, and 131,5, the neareſt to theſe are found over 51°, and the Diff. is 169, which multiplied by 6, gives 1014 Miles for the Diſtance. Then, with the Com. of Mid. Lat. 45, taken as a Cou. and a Sixth of the Dep. the Diſt. correſponding to theſe are 186, which being multiplied by 6, is 1116 Miles, the Diff. of Long.

Then

	D. M.		D. M.
Then to Long. left	5 14W.	Now Long. left	5 14W.
Add Diff. of Long. 1110, or	18 30W.	Diff. of Long. 1116, or	18 36W.
Long. in	23 44	Long in	23 50W.

Hence the direct Course is 51° W. or nearly S. W. $\frac{1}{2}$ W. Dist. 1014 Miles.

I have omitted the odd Minutes in the Complement of Middle Latitude, as the Longitude is found to a sufficient Degree of Exactness without them; but those who desire to see a greater Degree of Accuracy, may satisfy themselves by examining the last Edition of the Practical Navigator.

These are all the Cases that can well happen in a Day's Work at Sea; unless it so happens that a Ship's Course be due East or West, in which Case the Departure is reduced into Longitude by the following

Rule. With the Complement of the Latitude sailed in, taken as a Course among the Degrees, and the Departure taken in its Column, the corresponding Distance will be the Difference of Longitude.

EXAMPLE.

Suppose a Ship in Latitude 49° 30′ North or South, sails directly E. or W. 136,4 Miles, what is her Difference of Longitude?

Now 49° 30′, subtracted from 90°, gives 40° 30′, the Complement of the Latitude; and as it lies between 41 and 40 Degrees, I look for my Departure under 40, and find the corresponding Distance 212, and under 41, the Distance is 208 Miles, which added together is 420; Half of this Sum is 210, the Difference of Longitude required.

How to work a Traverse has been already shewn in Plane Sailing; but it is necessary here to shew how proper Allowances for Longitude are to be introduced into such Accounts, which is easily done by the following Method.

Find the Difference of Latitude and Departure for each Course and Distance, and set them down in the Traverse Table, as in Plane Sailing.

Find the whole Difference of Latitude and Departure, and with these find the Course and Distance made good, and the Latitude in, and Meridional Difference of Latitude, if you work by Mercator's Sailing; then with the Course and Meridional Difference of Latitude, find the Difference of Longitude.

But if you work by Middle Latitude Sailing, take the Complement of Middle Latitude, and with that and the Departure find the Difference of Longitude.

EXAMPLE.

Yeſterday at Noon we were in Latitude 38° 14′N. Longitude 25° 56′W. and have ſince run as per Log the following Courſes and Diſtances, viz. N. E. by N. $\frac{1}{4}$ E. 56 Miles; N. N. W. 38; N. W. by W. 46; S. S. E. S. by W. 20; and N. E. by N. 60 Miles. Required the Ship's Place, and her direct Courſe and Diſtance made good?

Courſes.		N.	S.	E.	W.
N. E. by N. $\frac{1}{4}$ E.	56	45,0		33,4	
N. N. W.	38	35,1			14,5
N. W. by W.	46	25,6			38,2
S. S. E.	30		27,7	11,5	
S. by W.	20		19,6		3,9
N. E. by N.	60	49,9		33,3	
		155,6	47,3	78,2	56,6
		47,3		56,6	
Diff. of Lat.		108,3	Dep.	21,6	

With the Difference of Latitude and Departure, the Courſe is found to be N. by E. and Diſtance 111 Miles.

By Mercator's Sailing.

	D.	M.		
Lat. left	38	14 N.	Mer. Parts	2486
Diff. of Lat.	1	48 N.		
Lat. come to	40	2 N.	Mer. Parts	2625
			Mer. Diff. Lat.	139

Under the Courſe 1 Point, look in the Latitude Column for the Meridional Difference of Latitude, the neareſt is 139,3, oppoſite to that is Departure 27,7, which is the Difference of Longitude.

Long. left	25°	56′W.
Diff. of Long. 27,7, or		28 E.
Long. in	25	28

By Middle Latitude Sailing.

	D.	M.	
Lat. left	38	14 N.	
Lat. in	40	2	
Sum Lats.	2) 78	16	
Mid. Lat.	39	8	
	90	0	
Com. Mid. Lat.	50	52	

Over 51 Degrees, I look in the Departure Column for my Departure, the neareſt is 21,8, oppoſite that in the Diſt. Column ſtands 28, which is my Difference of Longitude.

Hence it appears, that the Ship is in Latitude 40° 2′ N. and Longitude 25° 28′W. and has run S. by E. 111 Miles.

In like Manner may any Traverſe be worked, either by Middle Latitude or Mercator's Sailing.

A TABLE

A TABLE for the ready finding the Day of the Month the NEW MOON will fall on till the Year 1900, and consequently the MOON's Age, for any Day, by knowing the Golden Number, according to the Method commonly used for finding the Moon's Age.—Add 1 to the given Year, and divide the Sum by 19, the Remainder will be the Golden Number, which, being marked with Pencil at the Top of the Table, will shew the Golden Number during that Year.

Gn. No.	Ja. N	Ja. M	Feb. N	Feb. M	Ma. N	Ma. M	Apr. N	Apr. M	May N	May M	Ju. N	Ju. M	Jul. N	Jul. M	Au. N	Au. M	Sep. N	Sep. M	Oct. N	Oct. M	No. N	No. M	Dec. N	Dec. M
1	29	28	29	28	27	26	25	24	22	22	20	20												
2	18	17	19	17	17	16	15	13	12	11	10	9												
3	8	6	7	5	5	3	3	2	1.30	29	28	27												
4	26	25	27	25	25	23	22	20	19	8	17	17												
5	15	14	16	15	14	13	12	10	8	8	6	6												
6	4	3	5	3	3	1	1.30	29	27	27	25	25												
7	23	22	22	21	20	19	18	17	16	15	14	13												
8	12	10	12	10	10	8	8	6	5	4	3	3												
9	1	—	1	29	29	27	27	25	24	23	22	21												
10	20	18	20	19	18	17	16	15	13	13	11	11												
11	9	8	8	7	6	5	4	4	2	1	29	29												
12	27	26	27	26	25	24	23	22	20	20	18	18												
13	17	15	17	15	15	13	13	11	10	9	8	7												
14	6	4	6	5	4	3	2	1.30	29	28	27	26												
15	25	23	24	22	22	20	20	19	17	17	15	15												
16	13	12	13	12	11	10	9	8	6	6	4	4												
17	3	1	3	1	1.30	29	28	27	25	25	23	23												
18	22	20	22	20	20	18	18	16	15	14	13	12												
19	11	9	10	8	8	6	6	5	3	2	1	1.30												

Moon's Age.	Times Anf.
	High Water later each Day after the New and Ful Moons.
Days	H. M.
1	0 44
2	1 22
3	1 56
4	2 28
5	3 2
6	3 40
7	4 24
8	5 12
9	6 4
10	7 4
11	8 8
12	9 12
13	10 15
14	11 16
15	12 12
16	0 56
17	1 24
18	2 8
19	2 40
20	3 14
21	3 52
22	4 36
23	5 22
24	6 16
25	7 18
26	8 22
27	9 26
28	10 30
29	11 32
29½	11 12

Afternoon.

After Midnight.

From the Change to the Full, the Moon comes to the Meridian in the Afternoon; and from the Full to the Change, she comes to the Meridian after Midnight.

The Uſe of the foregoing Tables.

To find the Moon's Age, on any given Day, look in the firſt Column (marked Gn. No.) for the Golden Number, and under the Month, on the ſame Line, ſtands the Day of the New Moon; then count the Days which have completely paſſed ſince the laſt Change, and they will be her Age on the given Day.

To find the Time of High Water.

Look for the Moon's Age in the Table of Times, and the Hours and Minutes oppoſite to which being added to the Time of High Water, on the Change and Full Days, at any Place, will, if it does not exceed 12 Hours, give the Time of High Water there in the Afternoon of the given Day; but if it does exceed that Number, take 12 from it, and the Remainder will ſhew the Time of High Water in the Morning.

EXAMPLE I.

At what Time will it be High Water at London, April 29, 1796?

Oppoſite 11 the Golden Number, and under April, I find it was New Moon the 7th Day; and reckoning forward to April 29, gives 22 Days, for the Moon's Age.

Againſt 22, in the Table of Times, ſtand 4 Hours 36 Minutes, to which add 3 Hours, the Time of High Water at London on the Full and Change Days, and that gives 7 Hours 36 Minutes, the Time of High Water at London, in the Morning.

EXAMPLE II.

Required the Time of High Water at Dover, October 12, 1796?

Oppoſite to 11 the Golden Number, and under October, I find it was New Moon the firſt Day; reckoning forward to October 12, I find the Moon's Age is 11 Days; againſt 11 in the Table of Times ſtand 8 Hours and 8 Minutes. This added to 10 Hours 30 Minutes, the Time of High Water on Full and Change Days at Dover, gives 18 Hours 38 Minutes; from which I take 12, and the Remainder 6 Hours 38 Minutes is the Time of High Water in the Morning at Dover on the given Day.

EXAMPLE III.

What Time will it be High Water at the Start, July 10, 1796?

By the Tables it was New Moon the 4th Day, and reckoning forward to the 10th, I find there are 5 Days completely paſt. Againſt 5 in the Table of Times ſtand 3 Hours 2 Minutes, which added to 6 Hours the Time of High Water at the Start, on Full and Change Days, gives 9 Hours 2 Minutes, the Time of High Water in the Afternoon, on the above Day.

In like Manner may the Time of High Water be found at any other Place. Whoever will compare theſe Examples with the Methods uſed in other Books of this Kind, will find a conſiderable Differences as they frequently give the Moon's Age ſeveral Days, and of High Water, Hours wide of the Truth; indeed, on Account of the Irregularities in the Moon's Motion, the Times of her Change may differ half a Day from the Truth; and the Time of High Water 30 Minutes, but ſeldom more, if the Sea is not greatly influenced by the Wind.

The

The Tides do not always anſwer to the ſame Diſtance of the Moon from the Meridian, at the ſame Places, but are variouſly affected by the Action of the Sun, which brings them on ſooner when the Moon is in her firſt and third Quarters; and keeps them back later when ſhe is in her ſecond and fourth Quarters; becauſe, in the former Caſe, the Tides raiſed by the Sun alone would be earlier than the Tide raiſed by the Moon; and in the latter Caſe later, as may be ſeen in the Table of the Shifting of the Tides.

As the Nautical Almanack is become now of general Uſe in long Voyages, the Time of High Water at any Part of the World may be readily found, if the Time making High Water at Full and Change be known; for in the ſixth Page of each Month is given the Time of the Moon's Paſſage over the Meridian of Greenwich every Day. This Time may be reduced to the Meridian of any other Place, by allowing 1 Hour for every 15 Degrees of Longitude. To this time add the time making High Water there, on Full and Change Days, which gives the Time of High Water nearly on that Day, if the Sum be leſs than 12 Hours; but if above, ſubtract 12 Hours, or 24 Hours from it; obſerving, that the Days in this Almanack begin 12 Hours later than the common Day.

Among Pilots it is cuſtomary to reckon the Time of Flood, or High Water, by the Point of the Compaſs the Moon bears on at that Time, allowing three Quarters of an Hour for each Point. Thus, in Places where it is Flood at Noon on the Days of Full and Change, the Tide is ſaid to flow North and South, or at 12 o'Clock. In Places where the Moon bears 1, 2, 3, 4, or more Points to the Eaſt or Weſt of the Meridian, when it is High Water on the ſame Days, the Tide is ſaid to flow on ſuch a Point; ſo if the Moon bears S. E. at Flood, it is ſaid to flow S. E. and N. W. or 3 Hours before the Meridian, that is, 9 o'Clock; if ſhe bears S. W. it flows S. W. and N. E. or at 3 Hours after the Meridian; and in like Manner for other Points of the Moon's Bearing, as in the following Table:

A TABLE

A TABLE *of the Bearings of the* MOON *at the time of High Water, with the Time of thoſe Bearings at the following Places:*

When the Moon bears as follows.		H.	
N. and	S.	12	Iſle of Alderney, Gibraltar, Southampton, Beachy, Sheerneſs, a Sand called Kentiſh Knock, a Sand called the Swin at the Mouth of the Thames.
N. by E.	S. by W.	-0 3/4	or 45 Minutes paſt 12, Rocheſter, Fluſhing, Malden, Nore.
N. N. E.	S. S. W.	1 1/2	or 30 Minutes paſt 1, Bell Iſle, Tinmouth, Graveſend, Holyhead.
N. E. by N.	S. W. by S.	2 1/4	or 15 Minutes paſt 2, Berwick, Liſbon, St. Andrew's Gouquet.
N. E.	S. W.	3	Whitby, London, Amſterdam, Bourdeaux, Bay of Biſcay.
N. E. by E.	S. W. by W.	3 3/4	Breſt, Huntcliff, Iſle of Bas, at rhe Maes Scarborough.
E. N. E.	W. S. W.	4 1/2	In Breſound, Uſhant, Scilly, Cork, C. Clear
E. by N.	W. by S.	5 1/4	Humber Mouth, at the Spurn, Torbay, Start Point.
E.	W.	6	Hull, Wells, Weymouth, Plymouth, Ramhead.
E. by S.	W. by N.	6 3/4	Briſtol, Portland Road, Lynn, Foulneſs, Foy.
E. S. E.	W. N. W.	7 1/2	Lizard, Land's End, Falmouth, Penryn, C. Barfleur.
S. E. by E.	N. W. by W.	8 1/4	Eddiſtone, Yarmouth, Needles, Fly, Dublin, Iſle of Ely.
S. E.	N. W.	9	Iſle of Man, Iſle of Wight, E. End, Caſkets, Caen, St. Helen's.
S. E. by S.	N. W. by N.	9 3/4	N. Foreland, Dungeneſs, Dunnoſe, Shoreham
S. S. E.	N. N. W.	10 1/2	Downs, Deal, Dover, S. Foreland.
S. by E.	N. by W.	11 1/4	Margate, Harwich, Roſe, Pool, Portſmouth, Spithead, Calais.
S.	N.	12	Dunkirk, Embden, R. Elbe, Coaſt of Flanders, Oſtend.

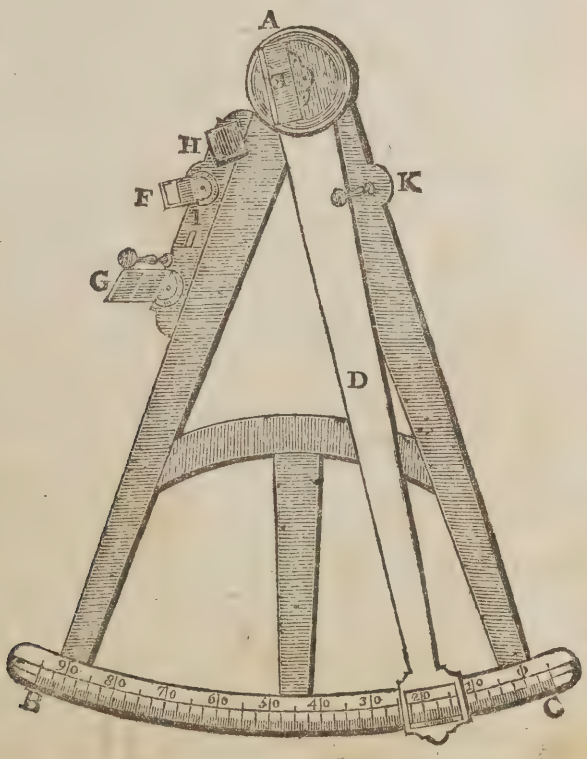
NOTE. The Current in the Downs generally runs 7 1/2 Hours to the North, and 5 1/4 Hours to the Southward; at Dover the Tide from the Channel runs Northward 7 1/4 Hours; and from the North 5 H. 10 M. at the Full and Change of the Moon. The Tides ſet in the Downs N. N. E. and S. S. W. Hourly. It is High Water at London 46 Minutes after Two at Full and Change by the Shore.

Pilots reckon 6 Hours for a Tide, then as 1/2 a Tide is 3 Hours, 1/4 Tide is 1 1/2 Hour, and half-quarter Tide is 3/4 of an Hour. So that if it flows Tide, half Tide, and quarter Tide, it is High Water at half an Hour after 10 o'Clock, which is the Caſe in the Downs by the Shore.

The

The Deſcription and Uſe of HADLEY's OCTANT, commonly called HADLEY's QUADRANT.

THE Principles of this admirable Inſtrument have been ſo well demonſtrated by other Hands, that a Repetition of it here ſeems to me unneceſſary, eſpecially to the Practical Mariner; I ſhall therefore content myſelf with a ſhort Deſcription thereof.



The principle Parts of this Inſtrument are,

The Index D
The Index Glaſs E
The Horizon Glaſſes G and F
The dark Glaſſes, or Screens H
The Sight Vanes K and G

The graduated Arch B C contains only 45 Degrees, or is the Eighth Part of a Circle, but is to be eſteemed as 90°, and ſo divided, becauſe by the double Reflection the Angle is doubled.

The

The Diviſions run 0, 10, 20, &c. to 90, as in the Figure, each Degree is divided into 3 Parts of 20 Minutes each, which by the Help of the Vernier, or Diviſions on the Index, is again ſubdivided into Minutes of a Degree, thus:

The Index D is a flat Bar moveable on the Centre of the Inſtrument, that Part of the Index that ſlides over the graduated Arch having the firſt and laſt Diviſions thereon correſponding to thoſe on the Arch, is called the Vernier or Nonius, and which divides every Subdiviſion on the Arch in Minutes; thus, 7 Diviſions on the Nonius being divided into 20 Parts, it is evident the Difference between the firſt Diviſions on the Arch and on the Nonius is $2\frac{1}{2}$ of one of the Sub-diviſions on the Arch, or 1 Minute, becauſe 7° there is divided into 21 Parts, being one in 20 greater than on the Arch. The Difference of the two firſt Diviſions will be 2′, and the Difference of the three firſt 3, and ſo on; hence it will ariſe, that in whatever Diviſions on the Vernier and Arch cut one another the neareſt, the Vernier will indicate how many Minutes above the next Sub-diviſion according as it is numbered to right or left thereof. On the Bottom of the Index againſt the Back of the Arch is a Screw made to fix faſt the Index when required.

The Arch, as before obſerved, is divided into 90 Degrees, numbered 0, 10, 20, 30, &c. and each Degree into 3 Parts, each 20, Minutes, and is to be read thus; 1d.—1d. 20m.—1d. 40m—2d.—2d 20m.—2d. 40m. —3d. &c. obſerving to read to the Diviſion that the 0, or Diamond-like Point of the Nonius laſt paſſed over; then the Nonius will give the Number of Minutes more, to be added to the Diviſion laſt paſſed by the Nonius. Thus, ſuppoſe the 0, or Δ of the Nonius has paſſed over 15 Degrees and two Parts, or 15d. 40m. and ſtands ſomewhere between 15d. 40m. and 16d. then obſerve what Diviſion or Line on the Nonius coincides with any Diviſion or Line on the Arch, that Number on the Nonius will be the Minutes to be added to 15d. 40m. Suppoſe 15 on the Nonius touches ſome Diviſion on the Arch, then 15m. muſt be added to 15d. 40m. and the Angle or Altitude meaſured will be 15d. 55m.

The Index Glaſs E is a Piece of Glaſs truly ground, ſilvered on the Back and fixed in a Braſs Frame, perpendicularly to the Index; its Uſe is to receive the Rays proceeding from any Object, and reflect them to the Horizon Glaſſes F and G; at the Back of the Braſs Frame of this Glaſs are two Screws, ſerving to adjuſt the Frame perpendicularly to the Index.

The Horizon Glaſſes F and G are ſmaller Pieces of ground Glaſs, one Part of which is ſilvered, and the other Part open or unſilvered, in order to look at an Object through it; theſe are ſet in Frames and placed perpendicularly on the Limb at G and F; their Uſe is to receive the Rays of any Object reflected from the Index Glaſs, and again to reflect thoſe Rays to the Eye through the Holes of the Sight Vanes K and G.

To adjuſt the Quadrant.

Firſt, The Index Glaſs muſt be perpendicular to the Plane of the Quadrant, which if not, you may thus diſcover: hold the Plane of the Quadrant in the Horizonal Poſition, with the Index Glaſs near the Eye; look right down the Quadrant in ſuch a Manner as to ſee the Arch of the Quadrant direct, and at the ſame Time reflected by the Index Glaſs; then if the Arch ſeen direct, together with its reflected Image, appear to be in one Line, the Index Glaſs is truly adjuſted, if not, it muſt be rectified by Means of the Screws placed at the Back of the Index Glaſs: It is eaſy to diſcover which Way the Inclination is, by preſſing the Index Glaſs with your Thumb while you obſerve the Arch.

Secondly, The Axis of the Horizon Glaſs muſt be parallel to the Axis of the Index Glaſs, if not, the Error is eaſily diſcovered and rectified in the Fore Horizon Glaſs when the Index Glaſs is adjuſted, thus: Bring O on the Nonius nearly to O on the graduated Arch, and look directly through the Sight Vane at the Moon or any bright Star, ſo as to ſee the reflected Image in the Horizontal Glaſs, and the Object at the ſame Time through the unſilvered Part; then move the Index backwards and forwards ſlowly, and obſerve if both Images coincide or paſs one behind another, which if they do, the Axis of both are parallel, which if not, you ſhould nicely adjuſt by the two Screws placed on the Top Block of the Horizon Glaſs.

If a ſmall Piece of coloured Glaſs ſet in Braſs be made to turn round to the Sight Vane occaſionally to guard the Eye, and the Screws turned back, the ſame Correction may be made by uſing the Sun inſtead of the Moon or Star.

To take the Altitude of the Sun by the Fore Obſervation.

The Sun's Image at any Time when not much obſcured by Clouds may be ſeen as reflected from the unſilvered Part of the Horizon Glaſs, by looking through the Hole in the Sight Vane; having put the Screens down to guard the Eye, hold the Inſtrument vertical, and turning towards the Sun, direct the Sight to that Part of the Horizon beneath the Sun, and moving the Index you may bring down the red Image of the Sun towards the Horizon; if the Sun's Image ſhould be faint you may turn back the Screens, and you cannot miſs it.

Having brought down the Sun's Image near the Horizon, ſwing the Quadrant backwards and forwards, making your Eye the Centre of Motion, and keep moving the Index at the ſame Time till the Sun's lower Edge juſt touches the Horizon, and you will have the Apparent Altitude of the Sun's lower Limb upon the Arch of the Quadrant at that Inſtant. But this Altitude is greateſt at Twelve o'Clock, when the Sun is on the Meridian, from which the Latitude is determined; much Time will be ſaved if you have a good Watch well regulated to tell you within a Minute or two when to begin your Obſervation, but this Apparent Altitude requires the four following Corrections:

Firſt, the Index Error, if any, to be added or ſubtracted.

Secondly, The Dip of the Horizon.

Thirdly, The Sun's Semi-diameter and Refraction.

Theſe four Corrections are neceſſary to find the true Altitude of the Sun's Centre nearly, the Correction for the Sun's Parallax being ſo ſmall, that it may always be neglected in determining the Latitude.

The Back Obſervation is managed the ſame as the Fore Obſervation, only your Back muſt be turned towards the Sun, and the Screens ſhifted to the Back Horizon Glaſs, remembering to ſubtract the Sun's Semi-diameter (if the Apparent lower Limb be taken) and add the Dip, ſubtracting the Effect of Refraction, and you will have the Altitude of the Sun's Centre.

The Correction for the Index Error is thus; turn down the ſmall Knob of Braſs, placed on the Limb, to hinder the Index from going off the Arch, as it may be in the Way. This Correction may be accurately eſtimated by taking the Diameter of the Sun, Moon, or any Object before and behind O on the Arch, that is bring the upper Limb of the Object to coincide with the lower, and note the Angle, then take it on the extra Arch, as it is called, that is bring the lower Limb to coincide with the upper, and note the Angle, half the Difference of theſe two Angles will be the true Correction of the Index Error.

EXAMPLE.

Suppoſe the Sun's Diameter meaſures 36 on the Arch, and 28 in the extra Arch. The Difference is 8′, half of which is the Error to be ſubtracted, be-

cauſe the Diameter meaſures more on the Arch, or gives the Sun's Diameter too much, but had the extra Arch given the greater Angle, the Error would have been additive.

To take the Altitude of the Moon.

The Moon's Altitude may be taken either by the Fore or Back Obſervation exactly in the ſame Manner as the Sun's Altitude, only here you muſt bring the Edge of the Moon into Contact with the Horizon, which is round and well defined, whether that be the upper or under Edge: The Corrections to be applied to the obſerved Altitude are as follows:

Firſt, The Index Error as before directed.

Secondly, The Dip to be ſubtracted in the Fore Obſervation, and to be added in the Back Obſervation.

Thirdly, Semi-diameter to be found in the Nautical Ephemeris for every Noon and Midnight at Greenwich; if very great Accuracy is required this Semi-diameter muſt be corrected for the intermediate Time; which being added to, or ſubtracted from the obſerved Altitude, will give the Apparent Altitude of her Centre.

Fourthly, Parallax and Refraction. The Moon's Horizontal Parallax for every Noon and Midnight at Greenwich is to be found in the Nautical Ephemeris. This muſt be corrected for the intermediate Time; then take the Proportional Logarithm of the Moon's Horizontal Parallax out of the Nautical Almanack, increaſe its Index by 10, and ſubtract the Log. Co-ſine of the Moon's Apparent Altitude from the Sum; the Remainder will be the Proportional Logarithm of her Parallax in Altitude; from which take the Moon's Refraction (Table 5), and the Remainder will be the Correction of the Moon's Altitude, which being added to her Apparent Altitude, will give the true Altitude of her Centre.

To take the Altitude of a Star by the Fore Obſervation.

Set the Index at O, and holding the Face of the Quadrant vertical direct the Sight to the Star, and at the ſame Time look for the reflected Image of the Star in the ſilvered Part of the Horizon Glaſs; move the Index a little, which will ſeparate the reflected Image from the direct Image, the former will be eaſily diſtinguiſhed from the latter by its Motion, when you ſtir the Index; continue to advance the Index, and at the ſame Time follow the reflected Image of the Star with your Eye, directing the Sight lower and lower, and changing the Poſition of the Quadrant or Octant, as the Image of the Star deſcends, till you have brought it down to the Horizon, the Index will then ſhew the obſerved Altitude of the Star. The Corrections to be applied to the obſerved Altitude of the Star are, firſt, the Index Error; ſecondly, the Dip, theſe two give the Apparent Altitude; thirdly, the Refraction, which gives the true Altitude; the fixed Stars have neither Semi-diameter nor Parallax worth Notice.

In taking the Altitude of a Star, or Moon, by Night, always get as near the Water as poſſible; in eaſy Weather a Grating may be ſlung over the Ship's Side, and an Obſerver ſit upon it to take the Altitudes; the ſame may be done to take the Altitude of the Sun in an hazy Horizon; for the nearer the Eye is to the Surface of the Water, the nearer the true Horizon will be to the Eye.

Advice to Seamen in the Choice of their Quadrants or Sextants.

The Joints of the Frame muſt be cloſe, without the leaſt Opening or Looſeneſs, and the Ivory on the Arch and Nonius inlaid and fixed, ſo as not to riſe at the Ends, nor above the Plane of the Inſtrument; all the Diviſions on the Arch and Nonius muſt be exceeding fine and ſtraight, ſo that when the Index or Nonius is ſet to any Diviſion on the Arch, the Diviſions on the Line that coincides may appear diſtinct, for only the firſt and

laſt Line on the Nonius will coincide with other Lines upon the Arch, if the Quadrant is well divided; likewiſe try in different Parts of the Arch, if the Nonius or Index Plate cuts regularly in Order with thoſe on the Arch; if they do not, the Diviſions are bad, and the Quadrant ought to be rejected.

Again, Look into the great Speculum or Index Glaſs ſlant-ways, holding it about ten or twelve Inches from the Eye, and obſerve the Image of ſome diſtant Object; if the Image appears clear and diſtinct in every Part of the Glaſs, the Speculum is good; but if it appears notched, or drawn with ſmall Lines, the Glaſs is veiny, and muſt be rejected; if more Images than one of the ſame Object are ſeen, it ſhews that the two Surfaces are not ground parallel; the other Speculum may be examined in the ſame Manner.

Obſerve the Sun or a Candle through the Dark Glaſſes ſeverally, holding the Glaſs about eight or ten Inches from the Eye; if they are veiny the Object will appear notched at the Edges, but if clear and well defined, the Glaſſes are good.

Quadrants, like Watches, may appear well to the Eye, and yet be good for little; it is therefore much better to give two Guineas and an Half, or three Guineas, for a good one, that will laſt a Man for Life, than purchaſe thoſe wretched Inſtruments made up at a low Price, which cannot be depended on.

Of the Dip and Refraction.

The Rays of Light in paſſing through the Atmoſphere are bent out of their ſtraight Courſe into a curve Line; and hence it happens that all the Heavenly Bodies, except when they are in the Zenith, appear higher than they ought to do, and ſo much the more the nearer they are to the Horizon. This apparent Elevation of the Heavenly Bodies above their true Height is called the Refraction of Objects; and the Quantity or Effect of it, according to the different Altitudes of Objects, has been carefully obſerved by eminent Aſtronomers, and muſt always be ſubtracted from the Apparent Altitude, but added to the apparent Zenith Diſtance of an Object, with whatever Inſtrument the Obſervation is made, in order to obtain its true Altitude or Zenith Diſtance.

That the Corrections of obſerved Altitudes of Objects, both on Account of the Dip of the Horizon and the Refraction of their Light, may appear at one View, they are both exhibited together in Tables 5 and 6.

To work an Obſervation, or to find the Latitude of a Place by the Tables of the Sun or Star's Declination and the Zenith Diſtance.

The Latitude of any Place is its Diſtance from the Equator, either North or South, counted in Degrees, &c. upon an Arch of the Meridian, contained between the Zenith, or that Point directly over your Head and the Equator. It can never exceed 90 Degrees, and is found by taking the Altitude or Height of the Sun or Star above the Horizon of the Sea with a Quadrant, when on the Meridian, or due North or South of the Place of Obſervation.

This Meridian Altitude, corrected for Dip of the Horizon, and Refraction, and 16 Minutes the Sun's Semi-diameter added thereto, gives the Altitude of his Centre, which being ſubtracted from 90°, gives the Zenith Diſtance or the Number of Degrees, &c. the Centre of the Object is from the Point over your Head; with which, and knowing how far the Object is to the North or South of the Equator, which is called Declination, the Latitude is found by the Meridian Altitude of any celeſtial Object as follows:

Firſt, If the Sun or Star be South when obſerved, call the Zenith Diſtance South; but if North, call it North.

Then, If the Zenith Diſtance and Declination be of contrary Names; that is, if the Sun or Star comes to the Meridian in the North, and hath South Declination, or to the South, and hath North Declination, the Zenith Diſtance, added to the Declination, gives the Latitude of the Place of Obſervation; and of the ſame Name the Declination is of, whether North or South.

Secondly, When the Zenith Diſtance and Declination are of the ſame Name; that is, when the Sun or Star comes to the Meridian in the North, and hath North Declination; or to the South, and hath South Declination, ſubtract the Leſſer from the Greater, and the Remainder is the Latitude; and to know whether it is North or South obſerve this general Rule:

When the Declination is greater than the Zenith Diſtance, the Latitude is of the ſame Name with the Declination; but if leſs, of a contrary Name.

Note. Firſt, When the Sun or Star is on the Equator, or hath no Declination, the Zenith Diſtance is the Latitude of the Place, and of a contrary Name to the Zenith Diſtance.

Secondly, When the Sun or Star is in the Zenith, the Declination is the Latitude, and of the ſame Name as the Declination is of. For it is evident, that as they are equally diſtant from the Equator, and on the ſame Side of it, conſequently if the Declination be North, the Latitude will be alſo North, and if South, South.

EXAMPLE I. and II.

Being at Sea May 27, 1796, the Sun's Meridian Alt. was found to be 57° 35′, and it was South of me, what Latitude was I in?

	90°	00′	
Meridional Altitude	57	35	
Zenith Diſt. =	32	25	S.
Sun's Dec. in Table for May 27, is }		28	N.
Latitude in =	53	53	N.

Being at Sea 24th July, 1796, the Meridian Altitude of the Sun was 27° 13′ being North of me, required the Latitude in?

	90°	00′	
Meridian Altitude =	27	13	N.
Zenith Diſt. =	62	47	N.
Sun's Dec. in Table for July 24 }	19	42	N.
Latitude in =	43	5	S.

EXAMPLE III.

Being at Sea Jan. 14, 1796, the Sun's Merid. Alt. was found 72° 17′ South, what was the Latitude of the Place of Obſervation?

	90°	00′	
Meridian Altitude	72	17	
Zenith Diſtance =	17	43	S.
Sun's Dec. Jan. 14, is	21	18	S.
Latitude in =	3	35	S.

In this Caſe, it is plain the Obſerver was between the Sun and the Equator.

Note. The Declination here is fitted to the Year 1796,

EXAMPLE IV.

Being at Sea the 4th of May, 1796, I obſerved the bright Star Fomelhaut 27° 21′ above the Horizon of the Sea, and it was South of me, required the Latitude in?

	90°	00′	
Meridian Altitude	27	21	
Zenith Diſtance	62	39	S.
Fomelhaut's Decl.	30	42	S.
Latitude in =	31	57	N.

The

The foregoing Rules are for obſerving by the Sun or Stars when they are at their greateſt Altitudes, or upon the Meridian above the Pole; but as in ſome Parts of the Earth the Sun does not ſet for ſeveral Days, and ſome Stars never ſet, in that caſe they may be obſerved upon the Meridian twice in 24 Hours, that is, once at their greateſt Height as before, and again when they are at their loweſt, or upon the Meridian below the Pole, to work which Obſervations, take the following

RULE. Add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude of the ſame Name with the Declination.

EXAMPLE V.

At Sea I took the Altitude of the North Pole Star, when on the Meridian below the Pole, and found it 46° 21′, required the Latitude?

Meridian Altitude		46° 21′ N.
Compl. Declination		1 47 N.
The Latitude in	=	48 8 N.

In the following Examples the Corrections for Dip and Refraction are introduced.

EXAMPLE VI.

By a fore Obſervation, the Alt. of the Sun's lower Limb was found by Hadley's Quadrant to be 40° 20′ S. when his Declination was 9° 56′ N. the Eye being 30 Feet above the Horizon. Required the Latitude of the Place?

Obſ. Alt. Sun's lower Edge	40°20′
Semi-diameter to be added	16
App. Alt. Sun's Centre	40 36
Dip of Hor. to be ſubtracted	05
App. Alt. corrected by Dip	40 31
Refraction to be ſubtracted	01
True Alt. of Sun's Centre	40 30
Zenith Diſtance	49 30 S.
Declination	9 56 N.
Latitude	59 26

EXAMPLE VII.

By a back Obſervation with Hadley's Quadrant, the App. Alt. of the Sun's lower Edge was 25° 12′ S. when his Declination was 21° 14′ S. and the Eye 40 Feet above the Horizon, in what Latitude was the Obſervation made?

EXAMPLE VIII.

Suppoſe the Eye of an Obſerver at 35 Feet above the Water ſhould with Hadley's Quadrant, by a fore Obſervation, find the Alt. of Sirius 53° 35′ S. when it paſſed the Meridian, having beforehand ſet his Watch, and found the Time of Sirius' Paſſage, required the Latitude of the Place of Obſervation?

Obſ. Alt. of Sirius	53°35′ 0″
Dip of Hor. to be ſubt.	5 39
App. Alt. above Hor.	53 29 21
Refraction to be ſubt.	42
True Alt. of Sirius	53 28 39
True Zenith Diſtance	36 31 21 S.
Sirius's Declination	16 25 58 S.
Latitude	20 5 23 N.

EXAMPLE IX.

Suppoſe on the 12th June 1796, an Obſerver in an high Northern Lat. and 65° Weſt of London, his Eye being 28 Feet high, obſerved the Alt. of the Sun's lower Limb on the Meridian below the Pole to be 8° 15′ S. by a fore Obſervation with Hadley's Quadrant. Required the Latitude?

Obſ. Alt. Sun's lower Edge	25° 12	S.
Semi-diam. to be ſubtracted	16	
App. Alt. Sun's Centre	24 56	
Dip of Hor. to be added	6	
Ap. Alt. correct by the Dip	25 2	
Refraction to be ſubtracted	2	
True Alt. Sun's Centre	25 0	
True Zenith Diſtance	65 0	S.
Declination	21 14	S.
Latitude	43 46	N.

The Sun being obſerved below the Pole, it muſt have been at 12 Hours paſt Noon at the Place of Obſervation, and that Place being 65° W. of London = 4 Hours 20′ later than at London, therefore it muſt have been 16h. 20′ paſt Noon at London.

*June 12, 1796, the Sun's Declination 23° 13′ 46″ the daily Variation is 3′ 12″: And as 24h. 3′ 12″ :: 16h. 20′ : 2′ 11″, which added to 23° 13′ 46″ (becauſe the Declination is increaſing) gives 23° 16′, the Sun's Declination at the Time and Place of Obſervation nearly.

* See Nautical Almanack for 1796.

App. Alt. Sun's lower Limb	8° 15′	S.
Semi-diameter added	16	
App. Alt. Sun's Centre	8 31	
Dip Horizon ſubtracted	05	
Sun's Alt. corrected by Dip	8 26	
Refraction to be ſubtracted	06	
True Alt. of Sun's Centre	8 20	
Com. Sun's Declination	66 44	
Latitude in	75 04	N.

Of the Variation of the Compaſs.

THE true Amplitude of the Sun, Moon, or a Star, is the Number of Degrees they riſe or ſet to the Northward or Southward of the Eaſt or Weſt Points of the Horizon; and is always of the ſame Name with the Declination; that is, if the Declination be North, the Amplitude is North; but if the Declination be South, the Amplitude is South of the Eaſt or Weſt Points of the Horizon at their Riſing and Setting.

To find the true Amplitude by the Table of Amplitudes, being Table XIV.

Look for the given Latitude in the Right Hand-Column of the Table, and the Declination at the Top; the common Angle of Meeting will be the Degrees and Minutes of the Amplitude required.

EXAMPLE

EXAMPLE I.

In Latitude 40° N. when the Declination was 17° N. required the Sun's true Amplitude at Riſing?

Oppoſite Latitude 40°, and under the Declination 17°, ſtand 22° 26′, the true Amplitude, and is to be counted from the Eaſt towards the North, becauſe it is at the Sun's Riſing, and the Declination is North; that is, E. 22° 26′ N.

But when the Latitude is given in Degrees, and the Declination in Degrees and Minutes, find the Latitude as before, and the neareſt Degrees to the given Declination at the Top, againſt which, and under the given Latitude, ſtands the true Amplitude; or, if the Minutes of the Declination be near 30, or half a Degree, find the Amplitude for the given Degrees of Declination, and the Amplitude for one Degree above it; add theſe two Amplitudes together, half their Sum will be the true Amplitude, ſufficiently exact for Practice at Sea.

EXAMPLE II.

Suppoſe I would know the Sun's true Amplitude at his Setting in Latitude 57°, his Declination being 11° 33′S.

Find the Amp. as before for the { 11° / 12 } which will be { 20° 29′ / 22 25 }

Lat. 57°, and the Declinations

their Sum 42 54

Half the Sum 21 27 is the true Amplitude, that is, W. 21° 27′S. becauſe at Sun Setting, and the Declination South. In like Manner, if the Declination be in Degrees, and the Latitude in Degrees and Minutes, as in

EXAMPLE III.

Suppoſe it were required to find the Sun's true Amplitude at Setting in Latitude 49° 27′, when his Declination was 21° N.

Now 27 Minutes being nearly Half a Degree, therefore,

For Lat. 49° { and Declination 21° } 33° 6′

For Lat. 50 { the Amplitudes are } 33 52

Sum 66 58

Half the Sum is 33 29, the true Amplitude required; that is, W. 33°29′ N. becauſe the Sun was Setting, and the Declination N.

When the Latitude and Declination are both given in Degrees and Minutes, take the neareſt Degrees to both, unleſs they are near 30 Minutes, as obſerved before, and find the Amplitude as in Example I.

EXAMPLE IV.

Suppoſe it were required to find the Sun's true Amplitude at Setting, in Latitude 49° 18′, his Declination being 19° 41′ N.

Now as the Latitude is neareſt to 49°, and the Declination neareſt 20°, therefore under Latitude 49° and againſt Declination 20, ſtands 31° 25′ N. the true Amplitude; that is, W. 31° 25′ N. the Declination being North, and at the Sun's Setting.

In like manner the Amplitude be found with ſufficient Accuracy, ſince it cannot be obſerved nearer than to Degrees at Sea.

To Find the Variation of the Compaſs.

Having found the true Amplitude, by the Table as before taught, it remains now to find the Variation of the Compaſs; to do which, we muſt have the True and Magnetic Amplitude given.

The Variation of the Compaſs is the Number of Degrees the Needle's Point ſtands from the true North or South Points of the Horizon, reckoned to the Eaſtward or Weſtward.

The Sun's Magnetic Amplitude is the Number of Degrees his Centre is Northward or Southward of the Eaſt or Weſt Point of the Compaſs at the Riſing or Setting, and is found by an Azimuth Compaſs in the following Manner:

Move the Box about till the four Cardinal Points of the Card coincide with the four Lines in the Sides of the Compaſs-Box: keep the Box ſteady, and turn the Index till the Centre of the Sun at Riſing or Setting, when his lower Edge juſt touches the Horizon, is ſeen through both the Sights; then the Degrees between the North Point of the Compaſs, and the End of the Index pointing to the Sun, will be the Magnetic Amplitude ſought.

Having thus found the True and Magnetic Amplitude, it is plain, that if they agree there is no Variation; but if they diff r, which they generally do, the Difference is the Variation.

When the Amplitudes are both North, or both South, ſubtract the Leſs from the Greater, and the Difference is the Variation.

But if one be North, and the other South, their Sum is the Variation: And to know which Way it is, obſerve this general

Rule. Let the Obſerver's Face be turned to the Sun; then, if the True Amplitude be to the Right Hand of the Magnetic, or obſerved Amplitude, the Variation is Eaſterly; but if it be to the Left Hand, Weſterly.

EXAMPLE I.

Suppoſe the Sun's true Amplitude at Riſing is E. 14° 26′N. but by Compaſs it is found to be E. 29° 12′ N. what is the Variation?

From the greater	E. 26° 12′N.
Take the leſſer	E. 14° 39′N.
Remains the Variation	11 43 E.

And is Eaſt, becauſe the true Amplitude is to the Right of the Obſerved.

EXAMPLE II.

Suppoſe the Sun's true Amplitude at Setting, W. 34° 30′S. and Magnetic Amplitude W. 23° S. required the Variation?

From the greater	W. 34° 30′S.
Take the leſs	W. 23° 00 S.
Remains the Variation	11 30W.

Which is Weſterly, becauſe the true Amplitude is to the Left of the Obſerved.

EXAMPLE III.

Suppoſe the Sun's true Amplitude at Riſing is E. 13° 30′ N. and his Magnetic Amplitude E. 12° 30′ S. required the Variation, and which Way?

Since the true Amplitude and Obſerved have different Names,

To the true Amplitude	E. 13° 30′N.
Add. the Obſ. Amp.	E. 12 30 S.
Sum is the Variation	32 coW.

Which is Weſterly, becauſe the true Amplitude is to the Left of the Obſerved.

EXAMPLE IV.

Suppoſe the Sun's true Amplitude is E. 1° 50′ S. and Magnetic Amplitude E. 32°28′, N. required the Variation, and which Way?

To the obſerved Amp.	E 32°.28′ N.
Add the true Am.	E. 1 50S.
Sum is the Variation	34 18 E.

Which is Eaſterly, becauſe the true Azimuth is to the Right of the Obſerved.

Of the Log and Half-Minute Glass.

THE Log, and Log-Line, by which we measure the Ship's Way at Sea, are too well known to every Mariner to be here described; let it suffice to give a few Remarks upon the Manner of dividing the Log-Line and trying the Half-Minute Glass.

The Divisions, or Knots, in the Log-Line are founded upon this, that each Knot should bear the same Proportion to a Sea Mile that half a Minute does to an Hour.

Now a Sea Mile is found to contain about 6120 Feet; this divided by 120 (the Half Minutes in an Hour) gives 51 Feet for the Distance between the Knots; but on Account of the Way the Log is found to make after the Ship, one Foot is thrown off, and 50 Feet is taken for the Knot, to answer to a Glass that runs 30 Seconds; this 50 Feet being divided by 10, gives 5 Feet to every Fathom, so that in casting up the Log in the Column of Fathoms, each Fathom answers to 1, or 1 Tenth of a Knot, and 10 Fathoms make a Knot, which is certainly the best adapted for Practice, since all the Tables and Instruments used in Navigation are decimally divided. But some experienced Commanders find, that the allowing 50 Feet to a Knot generally makes the Ship a-head of the Reckoning; and to avoid Danger, mostly divide the Log-line into Knots of 7 or 7 ½ Fathoms, of 6 Feet each, to correspond with a Glass that runs 28 Seconds. Others, again, divide the Seconds the Glass runs by 4, and take the Quotient for the Distance in Fathoms between the Knots: Which of these Methods are best, I leave to every Captain's own Experience to determine; but certain it is, that whatever Lengths the Knots are, the most convenient Way is to divide them into Tenths.

In hot or dry Weather, the Glass runs out faster than in moist or rainy Weather; therefore Care should be taken to try what Number of Seconds the Glass runs, which is easily done by the following Rule, if there is no Watch at hand which shews the Seconds:

Take a Musket Ball, or some such round Substance, and fasten a Piece of Packthread or Silk to it, and hang it by a Loop upon a Peg or Nail, so that the Distance between the Centre of the Ball and the Nail be 39,2 Inches, then give it a gentle Swing, turning your Glass at the same Time, and count the Number of Swings it makes while the Glass is running, and they will be the Seconds required.

Care should also be taken to measure the Log-line pretty often, lest it should stretch and deceive you in the Distance.

The Method of Keeping a Journal at Sea.

BY keeping a Journal, is meant keeping such an Account of the Ship's Way that the Mariner may be able at any Time to ascertain the Latitude and Longitude the Ship is in; it therefore should be the great Concern of every Person who takes upon him the navigating of Ships to remote Parts to be expert therein, as the Lives and Fortunes of so many Men are committed to his Charge.

When a Ship is bound from one Place to another, which lies so far from her, that she is obliged to go out of Sight of Land, for any considerable Time, as from

England to Jamaica; at the Time of her leaving Sight of Land, ſhe is ſaid to take her Dep. and that Part of the Land ſhe then leaves, is ſaid to be the Place ſhe takes her Dep. from, ſuch as the Land's End, Lizard, &c. and at the Time of taking ſuch Departure, the Captain or Mate generally takes the Bearing and Diſtance of that Land (according to his Judgment) and ſets it down on the Log-board, or in the Log-Book againſt the Time it was taken; thus, Land's End N. N. E. Diſt. 7 Leagues, or Lizard N. by W. Diſt. 5 Leagues, &c.

In the ſame Manner may the Departure from any Place be taken, as may be ſeen in the firſt Day's Log. of the following Journal, where the Log-Book is marked in Columns for Hours, Knots, Fathoms, Courſes, Winds, Leeway, Tranſactions; and under it the Columns for Courſes, Diſtances, Northings, or Southings, Eaſtings or Weſtings, the Latitude by Dead Reckoning, Latitude by Obſervation, Meridian Diſtance, Difference of Longitude, Longitude in, and in the laſt, the Bearing and Diſtance of the Land.

Notice muſt be taken, that in the Column for Courſe, you are always to ſet down the Courſe you have made by your Reckoning for that 24 Hours; that is, from the Noon of the Day before to the Noon of the Day you work on, the Sea Account being always kept from Noon to Noon.

In the Columns for Diſtance you are to ſet down the Diſtance made by your Reckoning for that 24 Hours.

In the Columns of Northing and Southing, you are to ſet down the Difference of Latitude made in that 24 Hours, marking the Column with North, if the Difference of Latitude be North; and South, if South.

In the Column of Eaſting or Weſting, you are to ſet down the Departure made that 24 Hours, marking the Column with Eaſt, if the Departure be Eaſt, and with Weſt, if Weſterly.

In the Column marked Latitude by D. R. you are to ſet down the Latitude you reckon yourſelf in on that Day; and in the Column marked Lat. by Ob. you are to ſet down the Latitude found by Obſervation. In the Column of Meridional Diſtance, you are to ſet down (in Degrees and Minutes) the whole Departure you have made from the Place you took your Departure from; alſo the Difference of Longitude made in the 24 Hours in the Column marked Diff. Long: the Longitude in, in the Column marked Long. in; and in the laſt, the Bearing and Diſtance from the Land.

The Variation, if any, muſt be allowed upon all Courſes ſteered, and upon all Bearings that are taken by the Compaſs; that is, if it be Eaſterly Variation, it muſt be allowed to the Right Hand, if Weſterly to the Left of the Courſe or Bearing. Suppoſing yourſelf placed in the Centre of the Compaſs, and looking directly forward to the Point, you are to allow the Variation upon.

EXAMPLE.

Suppoſe I ſteer S. W. and there is one Point Weſterly Variation, then my true Courſe is S. W. by S. or ſuppoſe I ſet a Point of Land, and find it to bear by the Compaſs E. S. E. and I know there is Half a Point Eaſterly Variation, then the true Bearing is S. E. by E. $\frac{1}{2}$ E.

Leeway muſt be allowed upon all Courſes ſteered, which is the Difference between the Point which the Ship endeavours to ſail upon, and the Point ſhe really ſails upon, and is cauſed by the Force of the Wind or Surge of the Sea, when ſhe is cloſe hauled or plying to Windward, which makes her fall off and glide ſideways from the Point of the Compaſs ſhe capes at, and muſt be allowed to be on the Right Hand of the Courſe ſteered when the Larboard Tacks are on board, and to the Left Hand when the Starboard Tacks are on Board. The Allowances that are generally made are as follow:

1ſt. When a Ship is cloſe hauled, if all her Sails be ſet, the Water ſmooth, and a moderate Gale of Wind, ſhe is then ſuppoſed to make little or no Leeway.

2dly.

2dly. The Ship being upon a Wind, and the ſmall Sails in, allow one Point for Leeway.

3dly. The Wind blowing hard, ſo as to cauſe one Top-ſail to be taken in, allow two Points for Leeway.

4thly. When it blows ſo hard that both Top-ſails are taken in, and the Sea runs high, allow then three Points for Leeway.

5thly. The Fore-ſail being furled, and the Ship tries under a Main-ſail and Mizen, allow four Points for Leeway; for ſhe then makes her Way about four Points before the Beam, as the Sea Phraſe is.

6thly. When the Ship tries under the Main-ſail only, ſhe then makes her Way about three Points before the Beam, that is, near five Points for Leeway.

7thly. If the Ship tries under the Mizen only, her Way is about two Points before the Beam; that is, allow ſix Points for her Leeway.

8thly. When ſhe lies a Hull, that is, with all her Sails furled, her Way is one Point before the Beam, and then ſeven Points is her Leeway.

9thly. When a Ship is lying-to under a Main-ſail, Mizen, &c. then obſerve how ſhe comes up and falls off, and take the Middle between the two Points, and from that allow the Leeway and Variation.

NOTE. In all Caſes, Reſpect muſt be had to the Smoothneſs of the Water, or the Sea's running high; the Mould and Trim of the Ship, and then the Allowances may be aſcertained with the greater Certainty, by ſetting the Ship's Wake by a Compaſs placed on each Rail of the Ship's Quarter, which is uſually ſet there for that Purpoſe.

EXAMPLE I.

Suppoſe I ſteer N. E. by E. with my Larboard Tacks on Board, and make one Point Leeway, then my Courſe made good is E. N. E.

Leeway and Variation, when they are both to be allowed one Way, that is, both to the Right Hand, or both to the Left, add them together, and allow their Sum the ſame Way they were to be allowed.

But if they are to be allowed one to the Right Hand, and the other to the Left, ſubtract the leſs from the greater, and allow the Remainder the ſame Way the greater was to be allowed.

EXAMPLE II.

Suppoſe I ſteer N. N. W. with my Starboard Tacks on Board, and make one Point Leeway, there being at the Time Half a Point Weſterly Variation; I would know my true Courſe?

Leeway to the left Hand	1 Point.
Variation to ditto	$\frac{1}{2}$ Point.
Their Sum to be allowed to the left Hand	1 $\frac{1}{2}$ whence

The true Courſe is N. W. by N. $\frac{1}{2}$ W.

EXAMPLE III.

Suppoſe I ſteer S. W. by W. with my Larboard Tacks on Board, and make two Points and an half Leeway, and I have one Point and a Quarter Weſterly Variation, what is my true Courſe?

Leeway to the right Hand	2 $\frac{1}{2}$ Points.
Variation to the Left Hand	1 $\frac{1}{4}$ Point.
The Remainder to be allowed to the right Hand	1 $\frac{1}{4}$ whence

The true Courſe is W. S. W. $\frac{1}{4}$ Weſterly.

EXAMPLE IV.

Suppoſe a Ship lying-to under a Mail-ſail, with her Starboard Tacks on Board, comes up E. by S. and falls off to N. E. by E. there being one Point Weſterly Variation, and ſhe makes 5 Points Leeway, what Courſe does ſhe make good?

The Middle between E. by S. and N. E. by E. is E. by N. for which allowing 6 Points to the left Hand, the true Courſe will be N. by E.

Currents, the way they ſet you, and the Diſtance you ſuppoſe you are driven by them, is to be ſet in the Traverſe Table for the Day, as any other Courſe and Diſtance.

EXAMPLE V.

Suppoſe I try the Current, and find it to ſet W. by N. per Compaſs one Mile per Hour, the Variation being one Point Eaſterly; then if I ſail in that Current 24 Hours, I ſet down in the Traverſe Table as a Courſe, W. N. W. Diſtance 24 Miles.

Heave of the Sea is to be accounted for in the ſame Manner as Currents: As, ſuppoſe there is a great Sea heaving towards the S. W. by my Compaſs, there being Half a Point Weſterly Variation, I then ſet down in my Traverſe Table S. W. by S. half Weſterly, with ſo much Diſtance as I judge the Sea has heaved the Ship.

At leaving the Land, the oppoſite Point to the Bearing, with the Variation allowed upon it, and the Diſtance you judge yourſelf from it, muſt be ſet down in the Traverſe Table as a Courſe and Diſtance.

EXAMPLE VI.

Suppoſe having two and a Quarter Points Weſterly Variation, the Start bearing by my Compaſs N. N. E. Diſtant four Leagues; the oppoſite Point to N. E. by N. is S. W. by W. which, with the Variation, makes S. $\frac{3}{4}$ Weſterly, for the Courſe to be ſet in the Traverſe Table diſtant 12 Miles.

When you make the Land your Bearing, itſelf (with the Variation allowed upon it) and the Diſtance you judge yourſelf from it, is to be ſet down in the Traverſe Table as a Courſe and Diſtance. This needs no Example.

The Courſes marked on the Log-board are the Courſes ſteered by the Compaſs. In order to obtain the true Courſe, it is neceſſary to allow both for the Variation of the Compaſs, and for the Leeway upon each Courſe on the Log-board, as has been ſhewn, before they are put into the Traverſe Table.

Every Day, at Noon, the Log-board is to be tranſcribed into the Log-book, which is ruled exactly like the Log-board.

Mariners reckon by the civil Account of Time uſed on Shore, but they keep the Reckoning for the Ship's Place, by beginning at Noon, and counting from thence 24 Hours to the next Noon. From Noon to Midnight they Mark with P. M. ſignifying after Mid-day; and the ſecond 12 Hours with A. M. ſignifying after Midnight, ending their Day's Work at the Noon of the civil Day. Hence their Ship's Account is 12 Hours earlier than their Shore Account of Time. And as the Sun's Declination uſed for finally determining the Ship's Place at the End of the Sea Day is calculated for the Noon of the common Day at London, therefore the Declination for the Noon of the civil Day muſt be taken for determining the Latitude, &c. at finiſhing their Day's Account.

There are various Methods of keeping a Sea Journal, according to the Sentiments of various Perſons with Regard to what deſerves being recorded: Some

Some approve of a Journal including the Log-book, each Day's Work at ſome Length, and ſuch Occurrences as ſeem of moſt Importance; while others prefer a ſhort Abſtract of this long Journal, containing little more than the Courſe run, the Latitude and Longitude in, and ſometimes the Bearing and Diſtance of the intended Port, or any other remarkable Cape, Rock, Iſland, &c. for each Day.

In the following Journal the long Form is uſed, as repreſenting more fully each Day's Work, and the neceſſary Corrections; and an Abſtract of this may be drawn out in the ſhorteſt Form that ſeems conſiſtent with Diſtinctneſs. The Learner ought to be thoroughly acquainted with the long Form, and when he does that, he may either continue it, or take the ſhorteſt Form; or retrenching from the firſt, and adding to the ſecond, what Particulars he thinks proper, he may thereby make out a Form adapted to his own particular Taſte.

Rules for correcting the Dead Reckoning by an Obſervation.

NOTWITHSTANDING the Rules already laid down for keeping a Ship's Way at Sea, yet by Reaſon of the ſeveral Accidents that may attend a Ship in one Day's Run, ſuch as ſwelling Seas, different Rates of ſailing between the Times of heaving the Log, Want of Care at the Helm in letting the Ship yaw or fall off, accidental Currents, ſudden Squalls, when no Account can be kept, &c. the Latitude by Account and Latitude by Obſervation may very often differ, then it is neceſſary that proper Corrections be made in the Difference of Longitude.

When you have made all proper Allowances you can, ſuch as for Leeway, Variation, Currents, &c. and ſtill find that your Latitude by Account will not agree with your Latitude by Obſervation, then you muſt correct as follows:

Firſt, Conſider whether you have made proper Allowances for Currents, Heave of the Sea, if the Courſe at the Helm has been carefully attended to, if the Log-line and Half-minute Glaſs be juſt, and the Log properly hove, or any ſudden Squalls, or proper Allowances made for the Leeway, &c. which of theſe you conjecture your Error is in; make what Allowances you think meet to your Difference of Latitude and Departure by Dead Reckoning, and ſee if that will reform your Latitude by Account, ſo as to make it agree with your Latitude by Obſervation; if it does, you have gueſſed right; (for you muſt always keep to the Latitude by Obſervation, it being the only Thing to be depended on;) but if it will not agree with the obſerved Latitude, it is to be ſuppoſed there are Miſtakes in your Conjecture, or ſome other Cauſe which produces the Error in the Reckoning, and ſtands in need of being corrected.

EXAMPLE.

Yeſterday at Noon we were in Lat. 36° 15′N. and have ſailed theſe 24 Hours S. E. ½ E. 55 Miles, N. E. by N 20 Miles, W. S. W. 70 Miles, S. by W. ½ W. 20 Miles, and by Obſervation this Day at Noon we are in Lat. 34° 56′N.

The TRAVERSE TABLE.

Courſes.	Diſt.	N.	S.	E.	W.
S. E. ½ E.	55		34.9	42.5	
N. E. by N.	20	16.6		11.1	
W. S. W.	70		26.8		64.7
S. by W. ½ W.	20		19.1		5.8
		16.6	80.8	53.6	70.5
			16.6		53.6
			64.2		16.9

By the Traverſe Table it appears, that by Account the Diff. of Lat. is 64.2 S. and the Departure 16.9 W.

Latitude ſailed from	36°	15′ N.
Difference of Latitude by Account	1	4 S.
Latitude in by Account	35	11 N.

Differing 15 Miles from the Latitude by Obſervation.

I firſt examine the Log-line and Half-minute Glaſs, and find them both right. Next I conſider whether there be any Current, and I think I have Reaſon to ſuſpect one: Upon Trial I find there is one ſetting S. S. W. ¾ W. at the Rate of 7 Fathoms an Hour, and judge I have been in it theſe 24 Hours. Then 7 Fathoms (or Tenths of a Knot) per Hour, in 24 Hours, makes about 17 Miles; and to the Diſt. 17 Miles, and Courſe S. S. W. ¾ W. the Diff. of Lat. is 14.6 S. and Departure 8.7 W.

	Diff. Lat.	Dep.			
Now by Tr. Table	64.2 S.	16.9 W.	Latitude ſailed from	36°	15′ N.
And by Current	14.6 S.	8.7 W.	Diff. of Lat. cor. for Cur.	1	19 S.
Correct for Cur.	78.8 S.	25 6	Lat. in correct for Cur.	34	56

Which agreeing with my Latitude by Obſervation, I conclude that my Reckoning is right; then having the Latitude left, and Latitude come to, the Difference of Longitude may be found either by Middle Latitude or Mercator's Sailing as before.

If after all proper Allowances are made for Errors in Diſtance, Currents, &c. the Latitude by Account and obſerved Latitude ſhould diſagree, then the Reckoning muſt yet be further corrected; to do which, the following are the common, and ſeem to be the moſt rational Methods.

CASE I.

If the Courſe found by Dead Reckoning be leſs than 3 Points or 33 Degrees.

RULE. To the Difference of Latitude and Departure by Account find a Courſe; to this Courſe and the Difference of Latitude by Obſervation, find the Difference of Longitude, either by Middle Latitude or Mercator's Sailing.

EXAMPLE.

EXAMPLE.

Yesterday at Noon we were in Lat. 39° 18′N. by an Observation; this Noon we are in Lat. 37° 48′ N. and our Dead Reckoning gives 107 Miles of Southing, and 64 of Westing; required the true Difference of Longitude.

To the Difference of Latitude 107, and Departure 64, I find the Course 2 ¾ Points; then with Meridional Difference of Latitude between the two Observations 115, and the same Course, I find the true Difference of Longitude 69 Miles.

CASE II.

If the Course found by Dead Reckoning be more than 3 Points or 33 Degrees, and less than 5 Points, or 56 Degrees.

Rule. With the Diff. of Lat. and Dep. by Account, find the Distance; with this Distance, and the Diff. of Lat. by Observation, find another Departure. Take half the Sum of this Dep. and Dep. by Account, for the true Dep. with which and the Diff. of Lat. by Observation, find the Diff. of Long.

EXAMPLE.

Yesterday at Noon we were in Lat. 52° 40′ N. and are this Noon in Lat. 54° 22′ N. having by Account made 84 Miles of Northing and 76 Miles of Westing; required the true Difference of Longitude?

To the Diff. of Lat. 84, and Dep. 76, the Distance is 113 Miles, and the Course 42 Degrees.

To Dist. 113, and Diff. of Lat. between the two Observations 102, the Dep. is 47.7; then 76 added to 47.7, is 123.7, half of which is 61.8, the true Dep.

To Dep. 61.8, and Diff. of Lat. by Observation 102, the Course is 31 Degrees, and with the Course 31 Degrees, and the Meridional Diff. of Lat. between the two Observations 171, I find the Diff. of Long. is 103 Miles.

CASE III.

If the Course by Dead Reckoning be more than 5 Points, or 56°.

Rule. With the Diff. of Lat. and Departure by Account find the Distance; then with this Dist. and Diff. of Lat. by Observation, find the Diff. of Long.

EXAMPLE.

Yesterday at Noon, we were in Lat. 38° 52′N. to-day at Noon we are in Lat. 40° 18′ N. and by Account have made 68 Miles of Northing, and 112 Miles of Westing; required the true Difference of Longitude?

With the Diff. of Lat. 68, and Depar. 112, I find the Dist. 132 Miles; and to Distance 132, and Diff. of Lat. by Observation 86, the Course 49° 30′ nearly; with this Course, and the Meridional Diff. of Lat. between the two Observations 111, the Diff. of Long is 130 Miles.

Note. As the true Place of a Ship depends upon her Lat. and Long. being truly ascertained, I have set these down only, the rest being of less Consequence to the Mariner.

To correct for several Days.

By Help of the three preceding Rules, the Long. may always be corrected for a single Day, but if an Observation has been wanted for one or

more Days, then mark the Lat. and Long. at laſt Obſervation, or if this be your firſt Obſervation ſince leaving the Land, mark the Lat. and Long. of the Land you left; this is the only Lat. and Long. you can call certain; all the following Part of the Reckoning muſt undergo a Correction, which is made as follows:

Take the Northings, Southings, Eaſtings, and Weſtings, that you have made ſince your laſt Obſervation; or if it be your firſt Obſervation, then for every Day from your leaving the Land, minding not to leave out the Diff. of Lat. and Dep. of the Day you correct on, and bring them into a Traverſe Table, by which you will have the whole Diff. of Lat. and Dep. by Account ſince the laſt Obſervation; and with that ſame Diff. of Lat. and Dep. find the Courſe by Dead Reckoning; then obſerve which of the foregoing Caſes that Courſe falls under, and correct by the Rule for that Caſe. But when an Obſervation has been wanting for ſeveral Days, then mark the Latitude and Longitude you were in at your laſt Obſervation, or leaving the Land as before, and then you may correct with a greater Degree of Certainty, eſpecially in high Latitudes, by the following Rules.

CASE I.

Reckoning from the laſt certain Latitude and Longitude.

When the Courſe given by the Mer. Diff. of Lat. and Diff. of Long. by Account, taken as Diff. of Lat. and Dep. is leſs than 3 Points, or 33 Degrees.

RULE. To the Mer. Diff. of Lat. and Diff. of Long. by Account, (taken as Diff. of Lat. and Dep. as ſhewn in the Mercator's Sailing) find a Courſe, with this Courſe and the Mer. Diff. of Lat. by Obſervation, find a correſponding Dep. which will be the correct Diff. of Long.

EXAMPLE.

Having ſailed three Days ago from Lat. 49° 57′ N. and got no Obſervation till this Day at Noon. and find I am in Lat. 45° 23′ N. and by Dead Reckoning I am in 45° 12′ N. having differed my Long. 171 Miles, required my true Difference of Longitude?

		M. Parts.			M. Parts.
Lat. ſailed from	49°57′N.	3470	Lat. ſailed from	49°57′	3470
Lat. by Account	45 12 N.	3047	Lat. by Obſer.	45 23	3063
Mer. Diff. of Lat. by Acc.		423	Mer. Diff. of Lat. by Obſ.		407

To Mer. Diff. of Lat. by Acc. 423, and Diff. of Long. by Acc. 171, the Courſe is 22°. Then with the Courſe 22°, and Merid. Diff. of Lat. between the Obſervations 407, I find the Diff. of Long. is 164 Miles.

CASE II.

When the Courſe given by the Merid. Diff. of Lat. and Diff. of Long. by Account, (taken as before) is greater than 3 Points, and leſs than 5 Points.

RULE. To the Merid. Diff. of Lat. and Diff. of Long by Account, taken as Diff. of Lat. and Dep. find a Diſtance; with this Diſtance, and Mer. Diff. of Lat. by Obſervation, find a correſponding Departure; half the Sum of this Dep. and the Diff. of Long. by Account, is the correct Diff. of Longitude.

EXAMPLE,

EXAMPLE.

Three Days ago we were in Lat. 45° 23′ N. and have ſince that Time ſailed between South and Weſt, have by Dead Reckoning altered our Lat. 94 Miles, and our Long. 147 Miles; but by an Obſervation this Day, we find we are in Latitude 43° 34′; required the correct Diff. of Long.

		M. Parts.			M. Parts.
Lat. ſailed from	45°23′N.	3063	Lat. ſailed from	45°23′	3063
Lat. by Acc.	43 29 N.	2931	Lat. by Obſ.	43 34	2910
Mer. Diff. of Lat. by Acc.		132	Mer. Diff. by Obſer.		153

With the Merid. Diff. of Lat. by Acc. 132, and Diff. of Long. by Acc. 147, I find the Diſtance 198, and Courſe 48°. Then to Diſtance 198, and Merid. Diff. of Lat. by Obſervation 153, the Dep. is 125; now 125 added to 147 is 272, and half this Sum, viz. 136, is the correct Diff. of Long.

CASE. III.

When the Courſe given by the Mer. Diff. of Lat. and Diff. of Long. by Account (taken as before) is more than 5 Points or 56 Degrees.

RULE. To the Merid. Diff. of Lat. and Diff. of Long. by Acc. taken as Diff. of Lat. and Dep. find a Diſtance.

To this Diſtance and Merid. Diff. of Lat. by Obſervation find a correſponding Dep. this Dep. will be the correct Diff. of Long.

EXAMPLE.

Two Days ago I was in Lat. 43° 34′ N. and have ſince then made by Acc. 50 Miles of Southing, and 256 Miles Diff. of Long. Weſt, but find by Obſervation that I am in 42° 30′ N. what is my true Diff. of Long.

		M. Parts.			M. Parts.
Lat. ſailed from	43°34′N.	2910	Lat. ſailed from	43°34′	2910
Lat. by Acc.	42 44 N.	2841	Lat. by Obſer.	42 30	2822
Mer. Diff. of Lat. by Acc.		69	Mer. Diff. of Lat. by Obſ.		87

Then to Merid. Diff. of Lat. by Acc. 69, and Diff. of Long. by Acc. 256 (taken as Diff. of Lat. and Dep.) the Diſtance is 265, and Courſe 73 Degrees.

And to Diſtance 265, and Diff. of Lat. 87 (the Merid. Diff. of Lat. by Obſervation) the Dep. is 250, which is the correct Diff. of Long.

Here we have given at ſome Length the different Methods of correcting the Dead Reckoning by an Obſervation, which are readily done by the Table of Diff. of Lat. and Dep.

A

JOURNAL of a VOYAGE

FROM

LONDON to St. MARY's,

ONE OF THE WESTERN ISLANDS,

IN THE

FRANCES OF LONDON,

GEORGE ROBINSON, Commander,

Kept by J. CROWDER, Mate.

Departure taken from the Lizard in Lat. 49° 57′N. Long. 5° 14′W.
Bound for St. Mary's, in Lat. 32N. Long. 25 6W.

In order to ſhorten the following Work, it may be proper to obſerve here, that + ſignifies Addition; — Subtraction; × Multiplication; ÷ Diviſion; = equal to; : :: : Proportion, or the Rule of Three, thus, 2 : 4 :: 3 : 6; that is, as 2 is to 8, ſo is 3 to 6.

Note. The following Journals exhibit moſt of the common Occurrences that happen at Sea, and is worked entirely by Inſpection from the Tables, and will be found ſufficiently exact for keeping a Ship's W[illegible] to any Part, without the trouble of a rigid Calculation by Logarithms.

To face Page 63

H.	K.	F.	Courſes.	Winds.	Lee. way	Remarks on Board, Sunday, Nov. 6, 1796.
2						Theſe 24 Hours moderate Gales, and fair Weather.
4						
6						
8	4		S. W. by W.	N. E.		At 6 P. M. the Lizard bore N. by E. Diſt. 6 Leagues, from which I take my Departure, it being in the Lat. of 49° 57′ N. and Long. 5° 14′ Weſt of London.
10	4	5				
12	5					
2	5		S. W.			
4	5	5				Unbent the Cables and ſtowed the Anchors.
6	5	5				Several Sail in Sight, ſtanding to Weſtward.
8	5	5				
10	5	5				
12	6					Variation 1 ½ Point Weſterly.

Courſe.	Diſt.	S	A	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. Lon.	Long. in.	Bearing and Diſt.
S. 27° W.	107	96	48	48. 21 N		0° 48′	73′	6° 27′ W.	St. Mary S 5° W. 1060 M.

The Lizard bearing N. E. by E. Diſt. 6 Leagues from the Ship, is the ſame as if the Ship had ſailed from the Lizard 6 Leagues or 18 Miles upon the oppoſite, or S. by W. Point of the Compaſs, and allowing for the Variation, as before taught, makes it S. half E. diſt. 18 M. which is to be ſet down as the firſt Courſe and Diſt. in the following Traverſe Table.

The firſt Courſe ſteered by Compaſs is S. W. by W. which allowing for the Variation, makes S. W. by S. half W. and the Sum of all the Diſtances ſailed on that Courſe till two o'Clock, when it alters, is 18 Miles and an half, which being doubled, becauſe the Log. is heaved every two Hours, gives 37 Miles; ſo the ſecond Courſe and Diſt. to be ſet down in the Traverſe Table is S. W. by S. half W. 37 Miles. In like Manner the ſecond Courſe ſteered is S. W. and the Variation allowed makes it S. S. W. half W. and the Diſt. on that Courſe ſummed up and doubled, gives 56 Miles; therefore the third Courſe and Diſtance to be ſet down in the Traverſe Table is S. S. W. half W. 56 Miles. Having found the whole Difference of Latitude and Departure made upon the ſeveral Courſes, I then mark down upon my Slate or Paper what every thing that is to be found comes to, and afterwards ſet them down in their proper Columns as above.

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. ½ E.	18		17.9	1.8	
S. W. by S. ½ W.	37		28.6		23.5
S. S. W. ½ W.	56		49.4		26.4
			95.9		49.9
					1.8
					48.1

Now to Diff. of Lat. 95. 9 S. and Dep. 48. 1 W. the Courſe is S. 27° W. Diſt. 107 Miles; then Lat. ſailed from, or Lizard's Lat. 49° 57′ N.

Diff. of Lat.	——	1 36 S.
Lat. in, or Ship's Lat.	—	48 21 N.
Sum of Lats.	——	98 18
Middle Lat.	—	49 9
Com. of Middle Lat.	—	40 51

Then with this Com. of Mid. Lat. 40° 51′ or 41° found as a Courſe among the Degrees, and the Dep. 48. 1 in its Column, in the Diſt. Col. ſtands 73, which is the Diff. of Long.

Longitude ſailed from, or Lizard's Longitude		5° 14′ W.
Difference of Longitude 73 Miles	——	1 13 W.
Longitude in, or Ship's Longitude	—	6 27 W.

Now to find the Courſe and Diſtance to the intended Port;

		Mer. Parts.		
Ship's Lat.	48° 21′ N.	3323	Ship's Long.	6° 27′ W.
St. Mary's Lat.	37 00 N.	2393	St. Mary's Long.	25 6 W.
Diff. Lat. 681 Miles =	11 21	Mer. Diff. Lat. 930	Diff. of Long. 1119 Miles =	18 39 W.

So from the Ship to St. Mary's the Courſe is found by Caſe I. in Mercator's Sailing, to be S. 50° W. Diſtance 1060 Miles.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Monday, Nov. 7th, 1796.
2	6		S. W. by W.	N.		Theſe 24 Hours moderate Gales and cloudy Weather.
4	5	5				
6	5			N. W.		At 4 P. M. Spoke with the Charming Nancy, from Carolina, bound to London.
8	5					
10	3	6	S. W.			
12	3	4				
2	3	4				
4	4	5				
6	4	6				P. M. got the beſt and ſmall Bower Anchors on the Gunnel, and unbent the Cables and ſtowed them.
8	5		S. W. by S.	W. N. W.		
10	4	5				
12	4					Variation 1 ½ Point Weſterly.

Courſe.	Diſt	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. Long.	Long. in	Bearings and Diſt.
S. 30° W.	107	93	53	46.48		1° 41′ W.	1° 19′ W.	7.46	St. Mary's S. 53° W. 76 Miles.

The Variation being allowed on each Courſe, and the Diſtances ſummed up, as before taught, the Traverſe Table, and other Work, will be as follows:

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. W. by S. ½ W.	43		33.2		27.3
S. S. W. ½ W.	39		34.4		18.4
S. by W. ½ W.	27		25.8		7.8
			93.4		53.5

Now to Diff. of Lat. 93.4 and Dep. 53.5 the Courſe is 30°, and Diſtance 107 Miles. To the Departure made Yeſterday 48 Miles, add the departure made this Day 53, gives 101 Miles, or 1° 41′, the Meridian Diſt. as above.

Lat. from, or laſt Day's Lat.	48° 21′ N.		Long. from, or laſt Day's Long.	6° 27′ W.	
Difference of Latitude	1 33 S.		Diff. Longitude	1 19 W.	
Latitude in, or Ship's Latitude	46 48 N.		Long in, or Ship's Long.	7 46 W.	
Sum Latitudes	95 09				
Middle Latitude	47 35				
Com. Mid. Lat.	42 25				

And to Com. Mid. Lat. 42. 25, or 42°, and Departure 53.5, the Difference of Long. is 79 Miles.

Then for the Courſe and Diſtance from the Ship to St. Mary's,

Ship's Lat.	46° 48′ N.	3185	Ship's Longitude	7° 46′ W.	
St. Mary's Lat.	37 00 N.	2393	St. Mary's Long.	25 6 W.	

Diff. of Lat. 588 = 9 48 Mer. Diff. 792 Diff. Long. 1040 Miles = 17° 20′

Hence the Courſe and Diſtance from the Ship to St. Mary's is found as above, by Caſe I. in Mercator's Sailing.

Note, As the Tables are only calculated to ſingle Degrees, the neareſt Degree to the Comp. of Middle Latitude is taken to find the Diff. of Long. by; which is near enough for all common Purpoſes at Sea; thus, the Com. of Mid. Lat. is 42° 25′, for which I take 42° to find the Diff. of Longitude.

It is immaterial whether the Diſtance of the intended Port, or any other Land you think proper to note in your Journal, be kept in Miles or Leagues; there is only 1 ½ Point Variation here allowed, though in the Channel it is about 25° W. and as this is intended only to ſhew the Manner of keeping a Journal, the Error of Variation is of little Conſequence to the Learner.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Tueſday, Nov. 8th, 1796.
2	4		S. W.	W. N. W.		Theſe 24 Hours moderate Gales and clear Weather.
4	4					
6	4					At 6 P. M. ſaw a Ship to the Northward.
8	4	4	S. W. by S.	W. by N.	½	
10	4	5				
12	4	6				
2	4	5				
4	4		S. S. W.	Weſt.	1	
6	4					
8	4					
10	4					
12	4					Variation 1 ¼ Point Weſterly.

Courſe.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. Long.	Long. in.	Bearing and Diſt.
S. 8° 30′ W	97	96	14	45.12 N	45.23	1.55 W	00 21	8.02	St. Mary's, S. 57° W. 020 Miles.

By allowing for Variation on each Courſe as before, and the Lee-way on the two laſt Courſes, the Work will be as follows:

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. S. W. ½ W.	24		21.2		11.3
S. by W.	36		35.3		7.0
S. ½ E.	40		39.8	3.9	
	Diff. Lat.		96.3	3.9	18.3
					3.9
					14.4

Now to Diff. of Lat. 96.3, and Dep. 14.4, the Courſe is S. 8° 30′ W. Diſt. 97 Miles.

Lat. from, or laſt Day's Lat.	46° 48′ N.
Difference of Latitude	1 36 S.
Latitude in by Account	45 12 N.
Sum Lats.	92 00
Middle Lat.	46 00
Com. Mid. Lat.	44 00

To Com. Mid. Lat. 44, and Dep. 14, the Diff. of Long. is 21 Miles.

Long. from, or laſt Day's Long.	7° 46′ W.
Difference of Longitude	0 21 W.
Longitude in by Account	8 7 W.

Here the Latitude by D. R. differing 11 miles from the Lat. by Obſervation, I correct for the true Longitude; and as this is the firſt Obſervation got ſince leaving the Land, I correct by Caſe I. Page 38, as follows:

		Mer. Parts.
Lizard's Latitude	49° 57′ N.	3470
Ship's Lat. by Account	45 12 N.	3047
Mer. Diff. of Lat. by Account		423
Lizard's Lat.	49° 57′ N.	3470
Ship's Lat. by Obſ.	45 23 N.	3063
Mer. Diff. by Obſervation		407
Lizard's Longitude	5° 14′ W.	
Ship's Long. by Acc.	8 7 W.	
Diff. of Long. by Acc.	2 53 = 173 Miles	

To Mer. Diff. of Lat. by Account 423, and Diff. of Long. 173, the Courſe is 2 Points; and to Courſe 2 Points, and Mer. Diff. of Lat. by Obſervation 407, the Diff. of Long. is 168.

Lizard's Long.		5° 14′ W.
True Diff. of Long.	168	= 2 48 W.
Ship's true Long.		8 2 W.

And to Courſe 2 Points, and Diff. of Lat. between Lizard and Ship 274, the Diſtance is 296 Miles.

Hence the Ship has ſailed from the Lizard S. S. W. 296 Miles, and the Courſe and Diſt. to the intended Port is found as above.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Wedneſday, Nov. 9, 1796.
2	3	5	S. by W. ¾ W.	Weſt	1	Theſe 24 Hours moderate Gales and clear Weather.
4	3	5				
6	3	5				
8	3					At 8 P. M. ſet up the Main and Mizen Top-Maſt Shrouds and Back-Stays.
10	3	5				
12	3					
2	3					
4	3		S. by W.	W. by S.	1	
6	3					
8	3					
10	3					Variation is 1 ¼ Point nearly, or 13° 48′ W. per Amplitude.
12	3					

Courſe.	Diſt.	S.	E.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. of Long.	Long. in.	Bearings and Diſt.
S. 9° E.	76	75	12	44° 8′		1′ 43′	0° 17′	7° 45′ W.	S. Mar.'s S. 61° 30 W. 868 Miles.

Allowing for the Variation and Leeway, as before, the Work will ſtand as under:

Traverse Table.

Courſes.	Diff.	N.	S.	E.	W.
S. ½ E.	46		45.8	4.5	
S. by E. ¼ S.	30		29.1	7.3	
	Diff. Lat.		74.9	11.8	

Now to Dif. of Lat. 74. 9 S. and Dep. 11. 8 E. the Courſe is S. 9° E. Diſt. 76.

Lat. from, or laſt Day's Lat.	45°	23′ N.
Diff. of Lat.	1	15 E.
Latitude in	44	8 N.
Sum Lats.	89	31
Mid. Lat.	44	45
Com. Mid. Lat.	45	15

And to Co. Mid. Lat. 45° 15′, or 45°, and Dep. 11. 8, the Diff. of Long. is 17′ E.

Long. from, or laſt Day's Long.	8°	2′ W.
Diff. of Long.	0	17 E.
Longitude in	7	45

Having the Lat. and Long. in, the direct Courſe and Diſtance to the intended Port is found (by Mercator's Sailing) as above.

Note. Then the Tenths on any Wide are more than 5, or half a Mile, you muſt call that Side one more than you found it to be; but when they are leſs than 5, then you need take no Notice of them; as in the above the Difference of Latitude and Departure are 74.9 and 11.8, which I call 75 and 12, becauſe the Tenths are above 5.

But when you take the Difference of Latitude and Departure to find the Courſe by, then take them in Miles and Tenths, the ſame may be obſerved in caſting up the Knots and Fathoms.

If, when doubled, the Tehths are more than 5, ſet one Mile more in the Traverſe Table; but if leſs, omit them, as there are no Tenths in the Diſtance Column. Some keep an Account of the Longitude made from the Place they take their Departure from, which is here omitted; thoſe that chuſe may make a Column for it.

H.	K.	F.	Courſes.	Winds.	Lee-way.	REMARKS on board, Thurſday, Nov. 10, 1796.
2	3	5	W. Handed	S. S. W.	3	Theſe 24 Hours hard Gales and ſqually, with ſmall Rains.
4	3	5	Main-Sail			
6	3	5	Handed Fore-	Sail		
8	Lay	too	up N. W. by N.	ff N. by E.		
10	drift	1½	Mile per Hour	W.	5	Saw a Ship to Windward with her
12	up.	N W	off N.	W. by S.	5	Jury-Maſts up.
2						
4						
6	Set	the	Fore-Sail cloſe	reefed.	and	Main-Sail, more moderate.
8	5		S. W.	N W b W ½ W	½	Set Top-Sails cloſe reefed.
10	5					
12	5					Variation 1¼ Point Weſterly.

Courſe.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. of Long.	Long. in	Bearing and Diſt.
S. 81° 30′ W.	25	4	25	44° 4′ N.		2° 8′	35′ W.	8° 20′ W.	St. Mary's S. 61° W. 876 Miles.

Taking the Middle Point between the Point on which the Ship comes up, and the Point which ſhe falls off for the ſecond and third Courſes, as taught in the Rules for lying-to, and then allowing as before for the Variation and Leeway, the Traverſe Table will ſtand as follows:

Courſes.	Diſt.	N.	S.	E.	W.
W. N. W. ¼ W.	21	7.1			19.8
N. N. E. ¾ E.	9	7.7		4.6	
N. by E. ¾ E.	9	8.5		3.0	
S. S. W. ¼ W.	30		27.1		12.8
		23.3	27.1	7.6	32.6
			23.3		7.6
			3.8		25.0

Now to Diff. of Lat. 3.8S. and Dep. 25W. the Courſe is 81° 30′W. Diſt. 25 Miles.

Lat. from, or laſt Day's Lat.	44°	08′N.
Diff. of Lat.	00	04 S.
Lat. in	44	04N.
Sum Lats.	88	12
Middle Lat.	44	06
Com. Mid. Lat.	45	54

And to Com. Mid. Lat. 45° 54′, or 46, and Deg. 25, the Diff. Long. is 35 Miles.

Long. from, or laſt Day's Long.	7°	45′W.
Diff. of Long. ——	0	35 W.
Long. in ——	8	20

Then to find the Courſe and Diſtance to St. Mary's;

Ship's Lat.	44° 4′N.	2952	Ship's Long.	8° 20′W.	
St. Mary's Lat.	37 00	2393	St. Mary's Long.	25 6	
Diff. of Lat. 424 Miles =	07 04	Mer. 558	Diff. of Long. 1006 =	16 46	

Hence the Courſe and Diſtance from the Ship to the intended Port is found as above.

NOTE. The Difference of Longitude each Day is found by Middle Latitude Sailing, which is ſufficiently exact for any ſingle Day's Run in theſe Latitudes, but the Bearing and Diſtance of the Land is found by Mercator's Sailing, Caſe I.

H.	K.	F.	Courſes.	Winds.	Lee way.	REMARKS on Board, Friday, Nov. 11th, 1796.
2				Calm.		The firſt 8 Hours calm and foggy, the reſt ſtiff Gales and clear.
4						
6						
8						A Current all Day ſetting N. W. by N. one Mile per Hour.
10	3	5	W. S. W.	S. E.	1	
12	4	4				
2	4	6				
4	4	8				
6	4	6				
8	4	8				
10	4	8				
12	4	5				Variation 1 ¼ Weſterly.

Courſes.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diff.	Diff. of Long.	Long. in.	Bearing and Diſt.
S. 8° W.	84	15	83	43° 49′ N.	43° 34′ N.	3° 31′ W.	2° 3′	10° 5′ W.	St. Ma. S. 60° W. Diſt. 790 M.

The Setting of the Current and its Drift in 24 Hours being made a Courſe and Diſtance, as has been taught, and the Variation and Leeway allowed for as before, the Work will be as follows:

TRAVERSE TABLE.

Courſes.	Diſt	N.	S.	E	W.
S. W. by W. ¾ W	72		30.8		65.1
N. W. ¼ W.	24	6.1			17.8
		16.1	30.8		82.9
			16.1		
			14.7		

Now to Diff. Lat. 14.7 S. and Dep. 82.9, W. the Courſe is S. 80° W. Diſt. 84 M.

Lat. from, or laſt Day's Lat.	44°	4′ N.
Diff. Lat.	00	15 S.
Latitude in	43	49 N.
Sum Lats.	87	53
Middle Lat.	43	57
Com. Mid. Lat.	46	3

And to Com. Mid. Lat. 46° 3′, or 46°, and Dep. 82.9, the Diff. of Long. is 115 Minutes.

Long. from, or laſt Day's Long.	8°	20′ W.
Diff. Long.	1	55
Long. in my Account	10	15

But the Lat. by Obſervation differing from the Lat. by Account, I correct for the true Long. and as our laſt Obſervation was three Days ago, I work as follows: (See Caſe II. Page 39)

		M. Parts.
Laſt obſerved Lat.	45° 23′ N.	3063
Ship's Lat. by Account	43 49 N.	2931
Mer. Diff. by Account		132
Laſt obſerved Lat.	45° 23′ N.	3063
Ship's Lat. by Obſ.	43 34 N.	2910
Mer. Diff. of Lat. by Obſ.		153

Long. at laſt Obſ.	8° 2′	
Ship's Long. by Acc.	10 15	
Diff. of Long. by Acc.	2 13 = 133 Miles	

To Mer. Diff. of Lat. by Acc. 132, and Diff. of Long. by Account 134, the Diſt. is 190.

And to Diſt. 190, and Mer. Diff. of Latitude by Obſervation 153, the Diff. of Longitude is 112.

Then 134 + 112 = 246, half this Sum 123 is the true Diff. of Long.

Long. at laſt Obſervation	8°	2′ W.
Diff of Long. 123 =	2	3 W.
Ship's true Long.	10	5

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Saturday, Nov. 12, 1796.
2	4	5	W. S. W.	S.		Theſe 24 Hours moderate Gales, with Showers of Rains.
4	4	5				A great Swell from the S. W. for which I allow 6 Minutes.
6	4	5				
8	4					
10	4					
11	4					
2	3	5				
4	3	5	S.W.byW	S. byE.		
6	3	5				
8	3					
10	3					
12	3					Variation 1 Point per Azimuth.

Courſe.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. of Long.	Long. in.	Bearing and Diſt.
S. 53° W.	83	50	67	42°44′N.		4° 38′	1° 32′ W.	11°37′	St. Ma. S. 61° 3. Diſt. 710 M.

In this Day's Work the Swell is to be conſidered as a Current, whoſe Drift in 24 Hours is 6 Miles, the Allowance made for the Swell; and as it comes from the S. W. it heaves the Ship towards the N. E. and the Variation allowed upon it makes laſt Courſe N. E. by N. as in the Traverſe Table.

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. by W.	58		32.2		48.2
S. W.	32		22.6		22.6
N. E. by N.	6	5		3.2	
		5	54.8	3.2	70.8
			5		3.3
			49.8		67.5

Now to Diff. of Lat. 49.8S. and Dep. 67.5, W. Courſe S. 53° W. Diſt. 83 Miles.

Lat. from, or laſt Day's Lat.	43°34′N.
Difference of Latitude	00 50 S.
Latitude	42 44 N.
Sum Lats.	86 18
Middle Lat.	43 09
Com. Mid. Lat.	46 51

To Com. Mid. Lat. 46°51′, or 47°, and Dep. 67.5, the Diff. of Long. is 93 Miles.

Long. from	10° 5′W.
Difference of Longitude, 92 Miles	1 32
Longitude in	11 37

To find the Bearing and Diſtance of the intended Port, on Mercator's Chart.

Lay a Ruler acroſs Mercator's Chart, in Lat. 42° 44′, and ſet one Foot of the Compaſſes on the Meridian of London, and the other in Long. 11° 37′ W. lay off that ſame Diſtance from the Meridian of London, by the Edge of the Ruler, and that will ſhew the Ship's Place. Then lay the Ruler over the Ship's Place, and St. Mary's, and take the neareſt Diſtance between the Ruler and Centre of the Compaſs, ſlide one Foot along the Side of the Ruler, and the other Foot will ſhew the Courſe to be S. W. by W. $\frac{1}{2}$ W. Then take in your Compaſſes the Diſtance between the Ship and St. Mary's, and apply it to the Meridian, (ſometimes marked with Leagues) taking care that the Points of the Compaſſes are as much above the one Place as they are below the other; the Degrees, or Leagues, between the Points will be the Diſtance: Thus, the Diſtance between the Ship and St. Mary's laid on the Meridian, is about 11$\frac{3}{4}$ Degrees, or 705 Miles = 235 Leagues. In like Manner may the Bearing and Diſtance between any two Places be found, and the Ship's Way pricked off upon the Chart by the Courſe and Diſtance made good every Day, as many do without finding the Difference of Longitude as practiſed by the Dutch, and others, though not ſo correct as to find the Longitude every Day.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on board, Sunday, Nov. 13, 1796.
2	3	5	S.W. by W. ½ W.	S.E. ½ E.	½	Moderate and hazy Weather.
4	4					
6	4	6				Made more Sail.
8	5		S.W. ½ W.		0	
10	6	4				
12	7					Set Top-Gallant-Sails.
2	7	3				
4	7	2				
6	7	3	S. W. by W.	S. by E.	½	
8	7	4				
10	7	5	S. ½ W.	E. S. E.	½	
12	7	4				Variation ¾ Point Weſterly.

Courſe.	Diſt.	S.	W	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. of Long.	Long in	Bearing and Diſt.
S. 40° E.	141	108	90	40.56		6° 8′ W	2° 1′	13.38 W.	St. Mary's bears S. 66° W. Diſt. 580 M.

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. W. by W. ¼ W	24		12.3		20.6
S. W. by S. ¾ W.	66		48.9		44.3
S. W. ¾ W.	29		17.3		23.3
S. ¼ W.	30		30.0		1.5
	Diff. Lat. 108.5			Dep.	89.7

Lat. from		42 44
Difference of Latitude		1 48
Latitude in		40 56
Sum of Lats.		83 40
Middle Latitude		41 50
		90
Com. of Mid. Lat.		48 10

To Com. Mid. Lat. 48, and Dep. 89.7, the Difference of Long. is 121.

Long. from		11 37
Diff. Longitude 121	=	2 1
Long. in		13 38

Ship's Lat.	40° 56′	Mer. Parts	2696	Ship's Long.	13° 38′
Lat. of St. Mary's	37 00	Mer. Parts	2393	St. Mary's Long.	25 6
Proper Diff. of Lat.	3 56	Mer. Diff. of Lat.	303	Diff. of Long.	11 28
	60				60
In Miles	236			In Miles	688

Hence the Courſe and Diſtance is found as above by Inſpection.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Monday, Nov. 14, 1796.
2	7	3	W by S.	E.S.E.		Freſh Breezes and ſqually with Rain.
4	7	4				
6	8					
8	7	6				
10	8	2				In Top-Gallant Sails.
12	8	3	W.	S.E.		
2	8	2				Saw a ſtrange Sail on our Lee-bow, ſtanding on the ſame Courſe with us; ſhe ſeemed to be a Snow deep laden.
4	7	7				
6	8	2	W. by N.			
8	7	5				
10	6	7				
12	6	6				Variation ¾ Point Weſterly.

Courſe.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. Long.	Long. in.	Bearing and Diſt.
S.80°30′W	182	30′	179	40°26′	40°20′	9°7′W.		17°37′	St. Mary's, b. S.60° 30′W. Diſt. 406 M.

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
W. S. W. ¼ W.	77		25·9		72·5
W. by S. ¼ W.	48		7·0		47·5
W. by N. ¾ W.	58	2·9			57·9
			32·9		
			2·9		
		Dif. Lat. 30		Dep. 177·9	

Lat. from	40° 56′
Diff. Lat.	0 30
Latitude in	40 26
Sum Lats.	81 22
Middle Lat.	½)40 41
	90
Com. Mid. Lat.	49 19

Now to Diff. Lat. 30 M. and Dep. 178, the Courſe is S. 80°30′W. and Diſt. 182 M. and to Com. Mid. Lat. 49° 19′, and Dep. 178 M. the Diff. of Long. is 236 M. = 3° 56′

Long. from	13 39
Long. in	17 35

But the Lat. by Account differing from the Lat. by Obſervation, I muſt correct for the true Long. and as it is two Days ſince my laſt Obſervation, I correct as follows, by Rule III. Page 48.

		M. Parts.
Laſt obſerved Lat.	43° 34′N.	2910
Lat. by Account	40 26	2647
Mer. Diff. Lat. by Account		253
Laſt obſerved Lat.	43° 34′	2913
Lat. by Obſ.	40 20	2649
Mer. Diff. of Lat. by Obſ.		261

Long. at laſt Obſ.	10° 5′
Long. in by Acc.	17 35
Diff. of Long. by Acc	7 30 = 450.

To Mer. Diff. Lat. by Acc. 253 M. and Diff. of Long. by Account 450 Miles, the Diſt. is 522 M. over 61°.

And to Diſt. 522 M. and Mer. Diff. Lat. by Obſ. 261 M. the Diff. Long. is 452 M. the true Diff. Long.

Long. at laſt Obſervation	10° 5′
Diff. of Long. 452 M.	7 32
True Long. in	17 37

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Tueſday, Nov. 15, 1796.
2	6	6	S. W.	S. S. E.	2	Freſh Breezes and cloudy.
4	7	2				
6	7	5				
8	6	8				
10	6	4	S. S. W.	S. E. by E.	1	A Current ſetting from W. ¼ S. all theſe 24 Hours ½ a Mile an Hour.
12	5	7				
2	5	2				
4	5	5				Made more ſail, the Breeze ſeeming to fall
6	6	2	W. ſ. W.	S. ½ E.	1½	away.
8	5	8				
10	4	8				Variation ¾ Point Weſterly, per Azimuth
12	4	6				obtained this Evening.

Courſe.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. Long.	Long. in.	Bearings and Diſt.
S. 51° 30′ W.	126	78	98	39.1		10² 45′ N.	2° 8′	19.45	St. Mary's b. S. 64° W. Diſt. 282 Miles.

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. W. by W ½ W.	56		28.8		48 0
S. S. W. ¼ W.	45		40.7		19.2
W. S. W. ¾ W.	44		10.7		42.7
E ½ bN.	12	2.3		11.8	
			80.2	11.8	1099
			2.3		11.8
	Diff. Lat.		77.9	Dep.	98.1

To Diff. Lat. 78 M. and Dep. 98 M. 1, the Courſe is S. 51° 30′, Diſt. 126 Miles.

Lat. from	40° 20′
Diff. Lat.	1 18
Lat. in	39 2
Sum	½)79 22
Middle Lat.	39 41
Com. Mid. Lat.	50 19

To Com. Mid. Lat. 50° 19′, and Dep. 98 M. the Diff. Long. is 128 = 2° 8′ W.

Long. from	17² 37′ W.
Long. in	19 45 W.

Ship's Lat.	39° 2′ N.	Mer. Diff.	2548	Ship's Longitude	19° 45′
St. Mary's Lat.	37 0	Mer. Diff.	2393	St. Mary's Long.	25 6
	2 2	Mer. Diff. Lat.	155		5 21
	60				60
Proper Diff. Lat.	122			Diff. Long.	321

Hence the Bearing and Diſtance is found as above.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Wedneſday, Nov. 16, 1796.
2	4	6	S. W.	S.E. by S.	1	Moderate Breezes and hazy Weather.
4	5					
6	5	4				Unſtowed the Anchors and bent the Cables.
8	5	6				
10	6		S. W. by W.	S. S. E.	½	
12	6	3				The Breeze falling off, got out Booms, and ſet Steering Sails.
2	5	7				
4	5	2				
6	6		W. by S.	S. E.		
8	6	3				
10	6	7				
12	7	2				Variation ¾ Point Weſterly.

Courſe.	Diſt.	S.	W.	Lat. by D. R.	Lat. by Obſ.	Mer. Diſt.	Diff. of Long.	Long. in.	Bearings and Diſt.
S. 58° W.	138	73	117	37.49		12° 42′ W.	2° 30′ W.	22° 15′	St. Mary's S. 70° 30′ W. Diſt. 146 M.

Traverse Table.

Courſes.	Diſt.	N.	S.	E.	W.
S. W. ½ W.	41		27.7		30.4
S. W. ⅔ W.	46		27.4		36.9
W. S. W. ¼ W.	53		17.9		49.9
	Diff. Lat.		73.0	Dep.	117.2

With Diff. Lat. 73 M. and Dep. 117 M. the Courſe is S. 58° W. and Diſt. 138 M.

Lat. from	39° 2′
Made Diff. Lat.	1 13
Lat. in	37 49
Sum	½)76 51
Middle Lat.	38 25
Com. Mid. Lat.	51 35

With Com. Mid. Lat. 51° 35′, and Dep. 117.2, the Diff. Long. is 150 M. = 2° 30′

Long. from	19 45
Long in	22 15

Ship's Lat.	37° 49′	Mer. Parts	2354	Ship's Long.	22° 15′
St. Mary's Lat.	37 00	Mer. Parts	2393	St. Mary's Long.	25 6
Proper Diff. Lat.	49	Mer. Diff. Lat.	61	Diff. of Long.	2 51 = 171.

H.	K.	F.	Courſes.	Winds.	Lee-way.	Remarks on Board, Thurſday, Nov. 10, 1796.
2	7	4	W. by S.	S. E.		Freſh Breezes and cloudy.
4	7	7				
6	8	2				At 10 A. M. ſaw the Iſland of St. Mary's bearing S. Diſt. 5 Leagues, and ſtood in for the Harbour with a ſmart Breeze.
8	8	5				
10	8	5	W.			
12	7	4				
2	8	2				
4	7	6				
6	7	5				
8	8		S. S. W. ½ W.			
10	8					
12						Variation ¾ Point Weſterly.

Courſe.	Diſt.	S	W.	Lat. by D. R.		Mer. Diſt.	Diff. Lon.	Long. in.
70° 30′	146	48	137	37.8		14° 59′	172	25° 7′ W.

Neceſſary REMARKS on coming into the CHANNEL.

PERSONS coming from a long Voyage, without Doubt, try for Ground in Time, and, if poſſible, would keep in the Latitude of 49°N. in which Latitude, and in 90 Fathoms Water, you will have fine Sand 66 Leagues from the Lizard; but ſhould you be in the Latitude of Scilly, then coarſe Ground, and 50 Fathoms. In coming in, having ſtruck Ground in 90 Fathoms, you will, from the Latitude 49° 30′ to 49°, meet with the ſame Depth; then, ſailing 6 or 7 Leagues, you will ſhoal 5 Fathoms at once; you run in that Depth for ſome Time, and deepen again; and perhaps in three Leagues you ſhoal again; for it is to be ſuppoſed the Ground is not gradual: You muſt therefore have Recourſe to the general Soundings, not to Particulars. But if, in coming in, you meet with Sand interſperſed with black Specks like beaten Pepper, and you have 64 Fathoms, then Scilly bears N. E. by N. 14 Leagues; and if, at any other Depth, you have the ſame Soundings from 90 to 64 Fathoms, you have the Channel fairly open. When you are in the Latitude 49° 30′, and have 75 Fathoms, you muſt be ſure to ſteer E. S. E. $\frac{1}{4}$ E. and then you will but keep your Latitude good; which, if poſſible, do not go to the Northward of, till you get within Scilly; nor then, without you have an Opportunity of making the Land. When you are abreaſt of Scilly, if you be not to the Southward of 49° 25′, nor to the Northward of 49° 30′, and have 60 Fathoms, you are ſure to be the Length of Scilly, and in the Latitude as before mentioned; with 35 Fathoms you are a-breaſt of the Lizard.

N. B. It is beſt to keep in the Latitude 49° 24′ and ſteer the above Courſe; for the Tide, a good Way to the Weſt of Scilly, runs 9 Hours to the Northward, and but 3 to the Southward.

If at any Time you ſhould be to the Southward, and have from 90 to 70 Fathoms, or in the Latitude of Uſhant, or farther Southerly, you will have reddiſh Gravel Sand, with many Pieces of Shells; which Sonndings are no where to be found in the Channel. If in the Latitude of Uſhant you have 86 Fathoms, you are diſtant from thence 36 Leagues; if 70 Fathoms, 11 Leagues; then you muſt be careful in the Night, or thick Weather, to come no nearer to it then 63 Fathoms, nor to the Leams than 65 Fathoms. You may know when you are to the Northward or to the Southward of Scilly by the Ground. When you are to the Northward, or in the Latitude of it, you have Ouze on the Lead from 85 to 60 Fathoms; then you muſt haul to the Southward till you meet with coarſer Ground, which you will have to the Southward of Scilly; you may depend on having Ouze on the Lead in this Latitude, or to the Northward of it; ſo that, if you keep the Lead going, you may prevent falling to the Northward. For your better knowing when you are near Scilly, you will find on the Lead black Stones, the like of which are no were elſe in the Channel. In the Night come no nearer than 53 Fathoms; and in that Depth you are not above 3 Leagues from the Scilly Rocks. That you may know if you be within Scilly, and in the Channel, ſtand to the Southward and you will have deeper Water; to the Northward and you will have ſhoaler. Come no nearer to the Lizard in the Night, than 45 Fathoms. If running up the Channel in the Night, keep without the Stream of 40 Fathoms, for in that Stream the Eddyſtone lies: Between the Start and Portland, no nearer than 24 Fathoms; nor from Portland to the Neſs, than 20 Fathoms, if in the Night or thick Weather. When you are in a fair Way up Channel, you will always have fine Sand, intermixed with black Specks and Hake's Teeth. By this Time you will moſt probably have made the Land; but obſerve,

that between Beachy and the Wight there are from 30 to 38 Fathoms Water, by which you may be led to imagine yourſelf farther out than you are. That Depth is found at four Leagues Diſtance from the Oars and Eaſtborough-head.

The Uſe of Mercator's Chart.

By the Latitude and Longitude in, to prick off the Ship on the Chart.

Rule. Lay the Ruler acroſs the Chart in the Latitude your Ship is in, then look upon the Equator, or Line marked with the Degree of Longitude, for the Longitude your Ship is in by your Reckoning, and ſetting one Foot of your Compaſſes in that Longitude, take the neareſt Diſtance to ſome North and South Line, and from where that Line croſſes the Edge of the Ruler that lies in the given Latitude; lay off that ſame Diſtance along the Edge of the Ruler to the right Hand, if the Longitude you are in was to the right Hand of the North and South Line, or to the left Hand, if it was to the left Hand; where this falls will be the Place of the Ship: But this will only do when the Longitude marked on the Chart, and your reckoning of Longitude in, are both counted from the ſame Meridian. Therefore, for a general Rule, take the following, viz.

To find how any Place bears from the Ship.

Rule. Lay a Ruler from the Place of the Ship to the Place you would know the Bearing of; then ſet one Foot of your Compaſſes in the Centre of ſome Compaſs near the Ruler, and take the neareſt Diſtance to the Edge of the Ruler; then run one Foot of your Compaſſes along by the Edge of the Ruler; keeping both Points perpendicular to it, and obſerving what Point of the Compaſs the other comes neareſt to, which will be the Bearing required.

To find the Diſtance of any Place from the Ship.

CASE I.

If the Place be in the ſame Longitude that the Ship is in, that is, if it bears due North or South, then the Difference of Latitude between them, turned into Miles or Leagues, will be the Diſtance.

CASE II.

If the Place be in the ſame Latitude the Ship is in, that is, if it bears due Eaſt or due Weſt, then take Half the Diſtance between the Ship and the Place in your Compaſſes; and ſetting one Foot on the Line marked with the Degrees of Latitude, in the Latitdue the Ship is in, ſee what Latitudes the other Foot will reach to, both above and below it; the Difference between theſe two Latitudes will be the Diſtance required.

When they are neither in the ſame Latitude nor in the ſame Longitude with the Ship.

CASE III.

Rule. Take the Difference of Latitude between both Places in your Compaſſes from the Equator, or graduated Parallel; and laying a Ruler over both Places, put one Foot on the Ship's Place, and ſlide your Compaſſes along the Edge of the Ruler (holding both Points parallel to the Meridian) until the other cuts the Parallel of Latitude paſſing through the Place,

(or

(or E. and W. Line cut by the Ruler) and then ſtay the Compaſſes. Take the Diſtance between where the Point reſted by the Edge of the Ruler and the Place (or where the Ruler croſſed the aforeſaid Eaſt and Weſt Line) in your Compaſſes, and apply it the Equator, or graduated Parallel, and that will give their Diſtance in Degrees, which may be turned into Miles or Leagues; and in the ſame Manner as you find the Bearing and Diſtance between the Ship and any Place, you may alſo find the Bearing and Diſtance of one Place from another; or if the Diſtance between the Ship and Place be taken in your Compaſſes, and applied to the Side of the Chart, or graduated Meridian, nearly in the Parallels of the Ship and Place, will give the Diſtance in Degrees as before; and for this Purpoſe there are generally marked on the Sides of Charts Scales of Leagues, by which the Diſtances between the Places may be readily found.

Or the Diſtance between two Places upon a Mercator's Chart may be eaſily found thus:

Take half the Diſtance between any two Places, and with one Foot of the Compaſſes in the Middle Parallel, extend both Ways upon the graduated Meridian; count the Number of Degrees between both Points, which will be your Diſtance, either in Leagues or Miles, according as the Scale is divided.

TABLE II. Difference of Latitude and Departure for $\frac{1}{4}$ Point.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.0	61	60.9	03.0	121	120.9	05.9	181	180.8	08.9	241	240.7	11.8
2	02.0	00.1	62	61.9	03.0	22	121.9	06.0	82	181.8	08.9	42	241.7	11.9
3	03.0	00.1	63	62.9	03.1	23	122.9	06.0	83	182.8	09.0	43	242.7	11.9
4	04.0	00.2	64	63.9	03.1	24	123.9	06.1	84	183.8	09.0	44	243.7	12.0
5	05.0	00.2	65	64.9	03.2	25	124.9	06.1	85	184.8	09.1	45	244.7	12.0
6	06.0	00.3	66	65.9	03.2	26	125.8	06.2	86	185.8	09.1	46	245.7	12.1
7	07.0	00.3	67	66.9	03.3	27	126.8	06.2	87	186.8	09.2	47	246.7	12.1
8	08.0	00.4	68	67.9	03.3	28	127.8	06.3	88	187.8	09.2	48	247.7	12.2
9	09.0	00.4	69	68.9	03.4	29	128.8	06.3	89	188.8	09.3	49	248.7	12.2
10	10.0	00.5	70	69.9	03.4	30	129.8	06.4	90	189.8	09.3	50	249.7	12.3
11	11.0	00.5	71	70.9	03.5	131	130.8	06.4	191	190.8	09.4	251	250.7	12.3
12	12.0	00.6	72	71.9	03.5	32	131.8	06.5	92	191.8	09.4	52	251.7	12.4
13	13.0	00.6	73	72.9	03.6	33	132.8	06.5	93	192.8	09.5	53	252.7	12.4
14	14.0	00.7	74	73.9	03.6	34	133.8	06.6	94	193.8	09.5	54	253.7	12.5
15	15.0	00.7	75	74.9	03.7	35	134.8	06.6	95	194.8	09.6	55	254.7	12.5
16	16.0	00.8	76	75.9	03.7	36	135.8	06.7	96	195.8	09.6	56	255.7	12.6
17	17.0	00.8	77	76.9	03.8	37	136.8	06.7	97	196.8	09.7	57	256.7	12.6
18	18.0	00.9	78	77.9	03.8	38	137.8	06.8	98	197.8	09.7	58	257.7	12.7
19	19.0	00.9	79	78.9	03.9	39	138.8	06.8	99	198.8	09.8	59	258.7	12.7
20	20.0	01.0	80	79.9	03.9	40	139.8	06.9	200	199.8	09.8	60	259.7	12.8
21	21.0	01.0	81	80.9	04.0	141	140.8	06.9	201	200.8	09.9	261	260.7	12.8
22	22.0	01.1	82	81.9	04.0	42	141.8	07.0	02	201.8	09.9	62	261.7	12.9
23	23.0	01.1	83	82.9	04.1	43	142.8	07.0	03	202.8	10.0	63	262.7	12.9
24	24.0	01.2	84	83.9	04.1	44	143.8	07.1	04	203.8	10.0	64	263.7	13.0
25	25.0	01.2	85	84.9	04.2	45	144.8	07.1	05	204.8	10.1	65	264.7	13.0
26	26.0	01.3	86	85.9	04.2	46	145.8	07.2	06	205.8	10.1	66	265.7	13.1
27	27.0	01.3	87	86.9	04.3	47	146.8	07.2	07	206.8	10.2	67	266.7	13.1
28	28.0	01.4	88	87.9	04.3	48	147.8	07.3	08	207.7	10.2	68	267.7	13.2
29	29.0	01.4	89	88.9	04.4	49	148.8	07.3	09	208.7	10.3	69	268.7	13.2
30	30.0	01.5	90	89.9	04.4	50	149.8	07.4	10	209.7	10.3	70	269.7	13.3
31	31.0	01.5	91	90.9	04.5	151	150.8	07.4	211	210.7	10.4	271	270.7	13.3
32	32.0	01.6	92	91.9	04.5	52	151.8	07.5	12	211.7	10.4	72	271.7	13.4
33	33.0	01.6	93	92.9	04.6	53	152.8	07.5	13	212.7	10.5	73	272.7	13.4
34	34.0	01.7	94	93.9	04.6	54	153.8	07.6	14	213.7	10.5	74	273.7	13.5
35	35.0	01.7	95	94.9	04.7	55	154.8	07.6	15	214.7	10.6	75	274.7	13.5
36	36.0	01.8	96	95.9	04.7	56	155.8	07.7	16	215.7	10.6	76	275.7	13.6
37	37.0	01.8	97	96.9	04.8	57	156.8	07.7	17	216.7	10.7	77	276.7	13.6
38	38.0	01.9	98	97.9	04.8	58	157.8	07.8	18	217.7	10.7	78	277.7	13.7
39	39.0	01.9	99	98.9	04.9	59	158.8	07.8	19	218.7	10.8	79	278.7	13.7
40	40.0	02.0	100	99.9	04.9	60	159.8	07.9	20	219.7	10.8	80	279.7	13.8
41	41.0	02.0	101	100.9	05.0	161	160.8	07.9	221	220.7	10.9	281	280.7	13.8
42	41.9	02.1	02	101.9	05.0	62	161.8	08.0	22	221.7	10.9	82	281.7	13.9
43	42.9	02.1	03	102.9	05.1	63	162.8	08.0	23	222.7	11.0	83	282.7	13.9
44	43.9	02.2	04	103.9	05.1	64	163.8	08.1	24	223.7	11.0	84	283.7	14.0
45	44.9	02.2	05	104.9	05.2	65	164.8	08.1	25	224.7	11.1	85	284.7	14.0
46	45.9	02.3	06	105.9	05.2	66	165.8	08.2	26	225.7	11.1	86	285.7	14.1
47	46.9	02.3	07	106.9	05.3	67	166.8	08.2	27	226.7	11.2	87	286.7	14.1
48	47.9	02.4	08	107.9	05.3	68	167.8	08.3	28	227.7	11.2	88	287.7	14.2
49	48.9	02.4	09	108.9	05.4	69	168.8	08.3	29	228.7	11.3	89	288.7	14.2
50	49.9	02.5	10	109.9	05.4	70	169.8	08.4	30	229.7	11.3	90	289.7	14.3
51	50.9	02.5	111	110.9	05.5	171	170.8	08.4	231	230.7	11.4	291	290.7	14.3
52	51.9	02.6	12	111.9	05.5	72	171.8	08.5	32	231.7	11.4	92	291.6	14.4
53	52.9	02.6	13	112.9	05.5	73	172.8	08.5	33	232.7	11.5	93	292.6	14.4
54	53.9	02.7	14	113.9	05.6	74	173.8	08.5	34	233.7	11.5	94	293.6	14.5
55	54.9	02.7	15	114.9	05.6	75	174.8	08.6	35	234.7	11.5	95	294.6	14.5
56	55.9	02.8	16	115.9	05.7	76	175.8	08.6	36	235.7	11.6	96	295.6	14.5
57	56.9	02.8	17	116.9	05.7	77	176.8	08.7	37	239.7	11.6	97	296.6	14.6
58	57.9	02.9	18	117.9	05.8	78	177.8	08.7	38	237.7	11.7	98	297.6	14.6
59	58.9	02.9	19	118.9	05.8	79	178.8	08.8	39	238.7	11.7	99	298.6	14.7
60	59.9	02.9	20	119.9	05.9	80	179.8	08.8	40	239.7	11.8	300	299.6	14.7
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II. Difference of Latitude and Departure for ½ Point.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.7	06.0	121	120.4	11.8	181	180.1	17.7	241	239.8	23.6
2	02.0	00.2	62	61.7	06.1	22	121.4	11.9	82	181.1	17.8	42	240.8	23.7
3	03.0	00.3	63	62.7	06.2	23	122.4	12.0	83	182.1	17.9	43	241.8	23.8
4	04.0	00.4	64	63.7	06.3	24	123.4	12.1	84	183.1	18.0	44	242.8	23.9
5	05.0	00.5	65	64.7	06.4	25	124.4	12.2	85	184.1	18.1	45	243.8	24.0
6	06.0	00.6	66	65.7	06.5	26	125.4	12.3	86	185.1	18.2	46	244.8	24.1
7	07.0	00.7	67	66.7	06.6	27	126.4	12.4	87	186.1	18.3	47	245.8	24.2
8	08.0	00.8	68	67.7	06.7	28	127.4	12.5	88	187.1	18.4	48	246.8	24.3
9	09.0	00.9	69	68.7	06.7	29	128.4	12.6	89	188.1	18.5	49	247.8	24.4
10	10.0	01.0	70	69.7	06.8	30	129.4	12.7	90	189.1	18.6	50	248.8	24.5
11	10.9	01.1	71	70.7	06.9	131	130.4	12.8	191	190.1	18.7	251	249.8	24.6
12	11.9	01.2	72	71.7	07.0	32	131.4	12.9	92	191.1	18.8	52	250.8	24.7
13	12.9	01.3	73	72.6	07.1	33	132.4	13.0	93	192.1	18.9	53	251.8	24.8
14	13.9	01.4	74	73.6	07.2	34	133.4	13.1	94	193.1	19.0	54	252.8	24.9
15	14.9	01.5	75	74.6	07.3	35	134.4	13.2	95	194.1	19.1	55	253.8	25.0
16	15.9	01.6	76	75.6	07.4	36	135.3	13.3	96	195.1	19.2	56	254.8	25.1
17	16.9	01.7	77	76.6	07.5	37	136.3	13.4	97	196.1	19.3	57	255.8	25.2
18	17.9	01.8	78	77.6	07.6	38	137.3	13.5	98	197.0	19.4	58	256.8	25.3
19	18.0	01.9	79	78.6	07.7	39	138.3	13.6	99	198.0	19.5	59	257.8	25.4
20	19.9	02.0	80	79.6	07.8	40	139.3	13.7	200	199.0	19.6	60	258.8	25.5
21	20.9	02.1	81	80.6	07.9	141	140.3	13.8	201	200.0	19.7	261	259.7	25.6
22	21.9	02.2	82	81.6	08.0	42	141.3	13.9	02	201.0	19.8	62	260.7	25.7
23	22.9	02.2	83	82.6	08.1	43	142.3	14.0	03	202.0	19.9	63	261.7	25.8
24	23.9	02.3	84	83.6	08.2	44	143.3	14.1	04	203.0	20.0	64	262.7	25.9
25	24.9	02.4	85	84.6	08.3	45	144.3	14.2	05	204.0	20.1	65	263.7	26.0
26	25.9	02.5	86	85.6	08.4	46	145.3	14.3	06	205.0	20.2	66	264.7	26.1
27	26.9	02.6	87	86.6	08.5	47	146.3	14.4	07	206.0	20.2	67	265.7	26.2
28	27.9	02.7	88	87.6	08.6	48	147.3	14.5	08	207.0	20.3	68	266.7	26.3
29	28.9	02.8	89	88.6	08.7	49	148.3	14.6	09	208.0	20.4	69	267.7	26.4
30	29.9	02.9	90	89.6	08.8	50	149.3	14.7	10	209.0	20.5	70	268.7	26.5
31	30.9	03.0	91	90.6	08.9	151	150.3	14.8	211	210.0	20.6	271	269.7	26.6
32	31.8	03.1	92	91.6	09.0	52	151.3	14.9	12	211.0	20.7	72	270.7	26.7
33	32.8	03.2	93	92.6	09.1	53	152.3	15.0	13	212.0	20.8	73	271.7	26.8
34	33.8	03.3	94	93.5	09.2	54	153.3	15.1	14	213.0	20.9	74	272.7	26.9
35	34.8	03.4	95	94.5	09.3	55	154.3	15.2	15	214.0	21.0	75	273.7	27.0
36	35.8	03.5	96	95.5	09.4	56	155.3	15.3	16	215.0	21.1	76	274.7	27.1
37	36.8	03.6	97	96.5	09.5	57	156.2	15.4	17	216.0	21.2	77	275.7	27.2
38	37.8	03.7	98	97.5	09.6	58	157.2	15.5	18	217.0	21.3	78	276.7	27.3
39	38.8	03.8	99	98.5	09.7	59	158.2	15.6	19	217.9	21.4	79	277.7	27.4
40	39.8	03.9	100	99.5	09.8	60	159.2	15.7	20	218.9	21.5	80	278.7	27.5
41	40.8	04.0	101	100.5	09.9	161	160.2	15.7	221	219.9	21.6	281	279.6	27.6
42	41.8	04.1	02	101.5	10.0	62	161.2	15.8	22	220.9	21.7	82	280.6	27.7
43	42.8	04.2	03	102.5	10.1	63	162.2	15.9	23	221.9	21.8	83	281.6	27.8
44	43.8	04.3	04	103.5	10.2	64	163.2	16.0	24	222.9	21.9	84	282.6	27.9
45	44.8	04.4	05	104.5	10.3	65	164.2	16.1	25	223.9	22.0	85	283.6	28.0
46	45.8	04.5	06	105.5	10.4	66	165.2	16.2	26	224.9	22.1	86	284.6	28.1
47	46.8	04.6	07	106.5	10.5	67	166.2	16.3	27	225.9	22.2	87	285.6	28.2
48	47.8	04.7	08	107.5	10.6	68	167.2	16.4	28	226.9	22.3	88	286.6	28.3
49	48.8	04.8	09	108.5	10.7	69	168.2	16.5	29	227.9	22.4	89	287.6	28.4
50	49.8	04.9	10	109.5	10.8	70	169.2	16.6	30	228.9	22.5	90	288.6	28.5
51	50.8	05.0	111	110.5	10.9	171	170.2	16.7	231	229.9	22.6	291	289.6	28.6
52	51.8	05.1	12	111.5	11.0	72	171.2	16.8	32	230.9	22.7	92	290.6	28.7
53	52.7	05.2	13	112.5	11.1	73	172.2	16.9	33	231.9	22.8	93	291.6	28.8
54	53.7	05.3	14	113.5	11.2	74	173.2	17.0	34	232.9	22.9	94	292.6	28.9
55	54.7	05.4	15	114.4	11.2	75	174.2	17.1	35	233.9	23.0	95	293.6	29.0
56	55.7	05.5	16	115.4	11.3	76	175.2	17.2	36	234.9	23.1	96	294.6	29.1
57	56.7	05.6	17	116.4	11.4	77	176.2	17.3	37	235.9	23.2	97	295.6	29.2
58	57.7	05.7	18	117.4	11.5	78	177.1	17.4	38	236.9	23.3	98	296.6	29.3
59	58.7	05.8	19	118.4	11.6	79	178.1	17.5	39	237.9	23.4	99	297.6	29.4
60	59.7	05.9	20	119.4	11.7	80	179.1	17.6	40	238.8	23.5	300	298.6	29.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 7½ Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.3	08.9	121	119.7	17.7	181	179.0	26.5	241	238.4	35.3
2	02.0	00.3	62	61.3	09.1	22	120.7	17.8	82	180.0	26.7	42	239.4	35.5
3	03.0	00.4	63	62.3	09.2	23	121.7	18.0	83	181.0	26.8	43	240.4	35.6
4	04.0	00.6	64	63.3	09.4	24	122.7	18.2	84	182.0	27.0	44	241.3	35.8
5	04.9	00.7	65	64.3	09.5	25	123.6	18.3	85	183.0	27.1	45	242.3	35.9
6	05.9	00.9	66	65.3	09.7	26	124.6	18.5	86	184.0	27.3	46	243.3	36.1
7	06.9	01.0	67	66.3	09.8	27	125.6	18.6	87	185.0	27.4	47	244.3	36.2
8	07.9	01.2	68	67.3	10.0	28	126.6	18.8	88	186.0	27.6	48	245.3	36.4
9	08.9	01.3	69	68.2	10.1	29	127.6	18.9	89	186.9	27.7	49	246.3	36.5
10	09.9	01.5	70	69.2	10.3	30	128.6	19.1	90	187.9	27.9	50	247.3	36.7
11	10.9	01.6	71	70.2	10.4	131	129.6	19.2	191	188.9	28.0	251	248.3	36.8
12	11.9	01.8	72	71.2	10.6	32	130.6	19.4	92	189.9	28.2	52	249.3	37.0
13	12.9	01.9	73	72.2	10.7	33	131.6	19.5	93	190.9	28.3	53	250.2	37.1
14	13.8	02.1	74	73.2	10.8	34	132.5	19.6	94	191.9	28.5	54	251.2	37.3
15	14.8	02.2	75	74.2	11.0	35	133.5	19.8	95	192 9	28.6	55	252.2	37.4
16	15.8	02.3	76	75.2	11.1	36	134.5	19.9	96	193.9	28.7	56	253.2	37.5
17	16.8	02.5	77	76.2	11.2	37	135.5	20.1	97	194.9	28.9	57	254.2	37.7
18	17.8	02 6	78	77.1	11.4	38	136.5	20.2	98	195.8	29.0	58	255.2	37.8
19	18.8	02.8	79	78.1	11.6	39	137.5	20.4	99	196.8	29.2	59	256.2	38.0
20	19.8	02.9	80	79.1	11.7	40	138.5	20.5	200	197.8	29.3	60	257.2	38.1
21	20.8	03.1	81	80.1	11.9	141	139.5	20.7	201	198.8	29.5	261	258.2	38.3
22	21.8	03.2	82	81.1	12.0	42	140.5	20.8	02	199.8	29.6	62	259.1	38.4
23	22.7	03.4	83	82.1	12.2	43	141.4	21.0	03	200.8	29.8	63	260.1	38.6
24	23.7	03.5	84	83.1	12.3	44	142.4	21.1	04	201.8	29.9	64	261.1	38.7
25	24.7	03.7	85	84.1	12.5	45	143.4	21.3	05	202.8	30.1	65	262.1	38.9
26	25.7	03.8	86	85.1	12.6	46	144.4	21.4	06	203.8	30.2	66	263.1	39.0
27	26.7	04.0	87	86.1	12.8	47	145.4	21.6	07	204.7	30.4	67	264.1	39.2
28	27.7	04.1	88	87.0	12.9	48	146.4	21.7	08	205.7	30.5	68	265.1	39.3
29	28.7	04.3	89	88.0	13.0	49	147.4	21.8	09	206.7	30.6	69	266.1	39.5
30	29.7	04.4	90	89.0	13.2	50	148.4	22.0	10	207.7	30.8	70	267.1	39.6
31	30.7	04.5	91	90.0	13.3	151	149.4	22.1	211	208.7	30.9	271	268.1	39.7
32	31.7	04.7	92	91.0	13.5	52	150.3	22.3	12	209.7	31.1	72	269.0	39.9
33	32.6	04.8	93	92.0	13.6	53	151.3	22.4	13	210.7	31.2	73	270.0	40.0
34	33.6	05.0	94	93.0	13.8	54	152.3	22.6	14	211.7	31.4	74	271 0	40.2
35	34.6	05.1	95	94.0	13.9	55	153.3	22.7	15	212.7	31.5	75	272.0	40.3
36	35.6	05.3	96	95.0	14.1	56	154.3	22.9	16	213.7	31.7	76	273.0	40.5
37	36.6	05.4	97	95.9	14.7	57	155.3	23.0	17	214.6	31.8	77	274.0	40.6
38	37.6	05.6	98	96.9	14.4	58	156.3	23.2	18	215.6	32.0	78	275.0	40.8
39	38.6	05.7	99	97.9	14.5	59	157.3	23.3	19	216.6	32.1	79	276.0	40.9
40	39.6	05.9	100	98.9	14.7	60	158.3	23.5	20	217.6	32.3	80	277.0	41.1
41	40.6	06.0	101	99.9	14.8	161	159.2	23.6	221	218.6	32.4	281	277.9	41.2
42	41.5	06.2	02	100.9	15.0	62	160.2	23.8	22	219.6	32.6	82	278.9	41.4
43	42.5	06.3	03	101.9	15.1	63	161.2	23.9	23	220.6	32.7	83	279.9	41.5
44	43.5	06.5	04	102.9	15.3	64	162.2	24.0	24	221.6	32.8	84	280.9	41.6
45	44.5	06.6	05	103.9	15.4	65	163.2	24.2	25	222.6	33.0	85	281.9	41.8
46	45.5	06.7	06	104.8	15.5	66	164.2	24.3	26	223.5	33.1	86	282.9	41.9
47	46.5	06.9	07	105.8	15.7	67	165.2	24.5	27	224.5	33.3	87	283.9	42.1
48	47.5	07.0	08	106.8	15.8	68	166.2	24.6	28	225.5	33.4	88	284.9	42.2
49	48.5	07.2	09	107.8	16.0	69	167.2	24.8	29	226.5	33.6	89	285.9	42.4
50	49.5	07.3	10	108.8	16.1	70	168.1	24.9	30	227.5	33.7	90	286.9	42.5
51	50.4	07.5	111	109.8	16.3	171	169.1	25.1	231	228.5	33.9	291	287.8	42.7
52	51.4	07.6	12	110.8	16.4	72	170.1	25.2	32	229.5	34.0	92	288.8	42.8
53	52.4	07.8	13	111.8	16.6	73	171.1	25.4	33	230.5	34.2	93	289.8	43.0
54	53.4	07.9	14	112.8	16.7	74	172.1	25.5	34	231.5	34.3	94	290.8	43.1
55	54.4	08.1	15	113.7	16.9	75	173.1	25.7	35	232.4	34.5	95	291.8	43.3
56	55.4	08.2	16	114.7	17.0	76	174.1	25.8	36	233.4	34.6	96	292.8	43.4
57	56.4	08.4	17	115.7	17.2	77	175.1	26.0	37	234.4	34.8	97	293.8	43.6
58	57.4	08.5	18	116.7	17.3	78	176.1	26.1	38	235.4	34.9	98	294.8	43.7
59	58.4	08.6	19	117.7	17.5	79	177.1	26.3	39	236.4	35.0	99	295.8	43.8
60	59.3	08.8	120	118.7	17.6	180	178.0	26.4	240	237.4	35.2	300	296.8	44.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Table II. Difference of Latitude and Departure for 1 Point.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	59.8	11.9	121	118.7	23.6	181	177.5	35.3	241	236.3	47.0
2	02.0	00.4	62	60.8	12.1	22	119.6	23.8	82	178.5	35.5	42	237.3	47.2
3	02.9	00.6	63	61.8	12.3	23	120.6	24.0	83	179.5	35.7	43	238.3	47.4
4	03.9	00.8	64	62.8	12.5	24	121.6	24.2	84	180.4	35.9	44	239.3	47.6
5	04.9	01.0	65	63.7	12.7	25	122.6	24.4	85	181.4	36.1	45	240.3	47.8
6	05.9	01.2	66	64.7	12.9	26	123.6	24.6	86	182.4	36.3	46	241.2	48.0
7	06.9	01.4	67	65.7	13.1	27	124.5	24.8	87	183.4	36.5	47	242.2	48.2
8	07.8	01.6	68	66.7	13.3	28	125.5	25.0	88	184.4	36.7	48	243.2	48.4
9	08.8	01.8	69	67.7	13.5	29	126.5	25.2	89	185.3	36.9	49	244.2	48.6
10	09.8	02.0	70	68.6	13.7	30	127.5	25.4	90	186.3	37.1	50	245.2	48.8
11	10.8	02.1	71	69.6	13.9	131	128.5	25.6	191	187.3	37.3	251	246.1	49.0
12	11.8	02.3	72	70.6	14.0	32	129.5	25.8	92	188.3	37.5	52	247.1	49.2
13	12.7	02.5	73	71.6	14.2	33	130.4	26.0	93	189.3	37.7	53	248.1	49.4
14	13.7	02.7	74	72.6	14.4	34	131.4	26.1	94	190.2	37.9	54	249.1	49.6
15	14.7	02.9	75	73.6	14.6	35	132.4	26.3	95	191.2	38.0	55	250.1	49.8
16	15.7	03.1	76	74.5	14.8	36	133.4	26.5	96	192.2	38.2	56	251.1	50.0
17	16.7	03.3	77	75.5	15.0	37	134.4	26.7	97	193.2	38.4	57	252.1	50.1
18	17.7	03.5	78	76.5	15.2	38	135.3	26.9	98	194 2	38.6	58	253.0	50.3
19	18.6	03.7	79	77.5	15.4	39	136.3	27.1	99	195.2	38.8	59	254.0	50.5
20	19.6	03.9	80	78.5	15.6	40	137.3	27.3	200	196.1	39.0	60	255.0	50.7
21	20.6	04.1	81	79.4	15.8	141	138.3	27.5	201	197.1	39.2	261	256.0	50.9
22	21.6	04.3	82	80.4	16.0	42	139.3	27.7	02	198.1	39.4	62	256.9	51.1
23	22.6	04.5	83	81.4	16.2	43	140.2	27.9	03	199.1	39.6	63	257.9	51.3
24	23.5	04.7	84	82.4	16.4	44	141.2	28.1	04	200.1	39.8	64	258.9	51.5
25	24.5	04.9	85	83 4	16.6	45	142.2	28.3	05	201.0	40.0	65	259.9	51.7
26	25.5	05.1	86	84.3	16.8	46	143.2	28.5	06	202.0	40.2	66	260.9	51.9
27	26.5	05.3	87	85.3	17.0	47	144.2	28.7	07	203.0	40.4	67	261.8	52.1
28	27.5	05.5	88	86.3	17.2	48	145.1	28.9	08	204.0	40.6	68	262.8	52.3
29	28.4	05.7	89	87.3	17.4	49	146.1	29.1	09	205.0	40.8	69	263.8	52.5
30	29.4	05.9	90	88.3	17.6	50	147.1	29.3	10	205.9	41.0	70	264.8	52.7
31	30.4	06.0	91	89.2	17.8	151	148.1	29.5	211	206.9	41.2	271	265.8	52.9
32	31.4	06.2	92	90.2	18.0	52	149.1	29.7	12	207.9	41.4	72	266.7	53.1
33	32.4	06.4	93	91.2	18.1	53	150.0	29.9	13	208.9	41.6	73	267.7	53.3
34	33.3	06.6	94	92.2	18.3	54	151.0	30.0	14	209.9	41.8	74	268.7	53.5
35	34.3	06.8	95	93.2	18.5	55	152.0	30.2	15	210.8	42.0	75	269.7	53.7
36	35.3	07.0	96	94.1	18.7	56	153.0	30.4	16	211.8	42.1	76	270.7	53.9
37	36.3	07.2	97	95.1	18.9	57	154.0	30.6	17	212.8	42.3	77	271.6	54.0
38	37.3	07.4	98	96.1	19.1	58	154.9	30.8	18	213.8	42.5	78	272.6	54.2
39	38.2	07.6	99	97.1	19.3	59	155.9	31.0	19	214.8	42.7	79	273.6	54.4
40	39.2	07.8	100	98.1	19.5	60	156.9	31.2	20	215.7	42.9	80	274.6	54.6
41	40.2	08.0	101	99.1	19.7	161	157.9	31.4	221	216.7	43.1	281	275.6	54.8
42	41.2	08.2	02	100.0	19.9	62	158.9	31.6	22	217.7	43.3	82	276.5	55.0
43	42.2	08.4	03	101.0	20.1	63	159.8	31.8	23	218.7	43.5	83	277.5	55.2
44	43.2	08.6	04	102.0	20.3	64	160.8	32.0	24	219.7	43.7	84	278.5	55.4
45	44.1	08.8	05	103.0	20.5	65	161.8	32.2	25	220.6	43.9	85	279.5	55.6
46	45.1	09.0	06	104.0	20.7	66	162.8	32.4	26	221.6	44.1	86	280.5	55.8
47	46.1	09.2	07	104.9	20.9	67	163.8	32.6	27	222.6	44.3	87	281.5	56.0
48	47.1	09.4	08	105.9	21.1	68	164.7	32.8	28	223.6	44.5	88	282.4	56.2
49	48.1	09.6	09	106.9	21.3	69	165.7	33.0	29	224.6	44.7	89	283.4	56.4
50	49.0	09.8	10	107 9	21.5	70	166.7	33.2	30	225.6	44.9	90	284.4	56.6
51	50.0	10.0	111	108.9	21.7	171	167.7	33.4	231	226.5	45.1	291	285.4	56.8
52	51.0	10.1	12	109.8	21.9	72	168.7	33.6	32	227.5	45.3	92	286.4	57.0
53	52.0	10.3	13	110.8	22.0	73	169.7	33.8	33	228.5	45.5	93	287.3	57.2
54	53.0	10.5	14	111.8	22.2	74	170.6	34.0	34	229.5	45.7	94	288.3	57.4
55	53.9	10.7	15	112.8	22.4	75	171.6	34.1	35	230.5	45.9	95	289.3	57.6
56	54.9	10.9	16	113.8	22.6	76	172.6	34.3	36	231.4	46.0	96	290.3	57.8
57	55.9	11.1	17	114.7	22.8	77	173.6	34.5	37	232.4	46.2	97	291.3	58.0
58	56.9	11.3	18	115.7	23.0	78	174.6	34.7	38	233.4	46.4	98	292.2	58.1
59	57.9	11.5	19	116.7	23.2	79	175.5	34.9	39	234.4	46.6	99	293.2	58.3
60	58.8	11.7	120	117.7	23.4	80	176.5	35.1	40	235.4	46.8	300	294.2	58.5
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 7 Points.

Table II. Difference of Latitude and Departure for 1 1/4 Point.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	59.2	14.8	121	117.4	29.4	181	175.6	44 0	241	233.8	58.6
2	01.9	00.5	62	60.1	15.1	22	118.3	29.6	82	176.5	44.2	42	234.7	58.8
3	02.9	00.7	63	61.1	15.3	23	119.3	29.9	83	177.5	44.5	43	235.7	59.0
4	03.9	01.0	64	62.1	15.6	24	120.3	30.1	84	178.5	44.7	44	236.7	59.3
5	04.9	01.2	65	63.1	15.8	25	121.3	30.4	85	179.5	45.0	45	237.7	59.5
6	05.8	01.5	66	64.0	16.0	26	122.2	30.6	86	180.4	45.2	46	238.6	59.8
7	06.8	01.7	67	65.0	16.3	27	123.2	30.9	87	181.4	45.4	47	239.6	60.0
8	07 8	01.9	68	66.0	16.5	28	124.2	31.1	88	182.4	45.7	48	240.6	60.3
9	08.7	02.2	69	66.9	16.8	29	125.1	31.3	89	183.3	45.9	4	241.5	60.5
10	09.7	02.4	70	67.9	17.0	30	126 1	31.6	90	184.3	46.2	50	242.5	60.7
11	10.7	02.7	71	68.9	17.3	131	127.1	31.8	191	185.3	46.4	251	243.5	61.0
12	11.6	02.9	72	69.8	17.5	32	128.0	32.1	92	186.2	46.7	52	244.4	61.2
13	12.6	03.4	73	70.8	17.7	33	129.0	32.3	93	187.2	46.9	53	245.4	61.5
14	13.6	03.2	74	71.8	18.0	34	130.0	32.6	94	188.2	47.1	54	246.4	61.7
15	14.6	03.6	75	72.8	18.2	35	131.0	32.8	95	189.2	47.4	55	247.4	62.0
16	15.5	03.9	76	73.7	18.5	36	131.9	33.0	96	190.1	47.6	56	248.3	62.2
17	16.5	04.1	77	74.7	18.7	37	132.9	33.3	97	191.1	47.9	57	249.3	62.5
18	17 5	04.4	78	75.7	19.0	38	133.9	33.5	98	192.1	48.1	58	250.3	62.7
19	18.4	04.6	79	76.6	19.2	39	134.8	33.8	99	193.0	48.4	5	251.2	62.9
20	19.4	04.9	80	77.6	19.4	40	135.8	34.0	200	194.0	48 6	6	252.2	63.2
21	20.4	05.1	81	78.6	19.7	141	136.8	34.3	201	195.0	48.8	261	253.2	63.4
22	21.3	05.3	82	79.5	19.9	42	137.7	34.5	02	195.9	49.1	62	254.1	63.7
23	22.3	05.6	83	80.5	20.2	43	138.7	34.7	03	196.9	49.3	63	255.1	63.9
24	23.3	05.8	84	81.5	20.4	44	139.7	35.0	04	197.9	49.6	64	256.1	64.2
25	24.3	06.1	85	82.5	20.7	45	140.7	35.2	05	198.9	49.8	65	257.1	64.4
26	25.2	06.3	86	83.4	20.9	46	141.6	35.5	06	199.8	50.1	66	258.0	64.6
27	26.2	06.6	87	84.4	21.1	47	142.6	35.7	07	200.8	50.3	67	259.0	64.9
28	27.2	06.8	88	85.4	21.4	48	143.6	36.0	08	201.8	50.5	68	260.0	65.1
29	28.1	07.0	89	86.3	21.6	49	144.5	36.2	09	202.7	50.8	69	260.9	65.4
30	29.1	07.3	90	87.3	21.9	50	145.5	36.5	10	203.7	51.0	70	261.9	65.6
31	30.1	07.5	91	88.3	22.1	151	146.5	36.7	211	204.7	51.3	271	262.9	65 9
32	31.0	07.8	92	89.2	22.4	52	147.4	36.9	12	205.6	51.5	72	263.8	66.1
33	32.0	08.0	93	90.2	22.6	53	148.4	37.2	13	206.6	51.8	73	264.8	66.3
34	33.0	08.3	94	91.2	22.8	54	149.4	37.4	14	207.6	52.0	74	265.8	66.6
35	34.0	08.5	95	92.2	23.1	55	150.4	37.7	15	208.6	52.2	75	266.8	66.8
36	34.9	08.7	96	93.1	23.3	56	151.3	37.9	16	209.5	52.5	76	267.7	67 1
37	35.9	09.0	97	94.1	23.6	57	152.3	38.2	17	210.5	52.7	77	268.7	67.3
38	36.9	09.2	98	95.1	23.8	58	153.3	38.4	18	211.5	53.0	78	269.7	67.6
39	37.8	09.5	99	96.0	24.1	59	154.2	38.6	19	212.4	53.2	79	270.6	67.8
40	38.8	09.7	100	97.0	24.3	60	155.2	38.9	20	213.4	53.5	80	271.6	68.0
41	39.8	10.0	101	98.0	24.5	161	156.2	39.1	221	214.4	53.7	281	272.6	68.3
42	40.7	10.2	02	98.9	24.8	62	157.1	39.4	22	215.3	53.9	82	273.5	68.5
43	41.7	10.4	03	99.9	25.0	63	158.1	39.6	23	216.3	54.2	83	274.5	68.8
44	42.7	10.7	04	100.9	25.3	64	159.1	39.9	24	217.3	54.4	84	275.5	69.0
45	43.7	10.9	05	101.9	25.5	65	160.1	40.1	25	218.3	54.7	85	276.5	69.3
46	44.6	11.2	06	102.8	25.8	66	161.0	40.3	26	219.2	54.9	86	277.4	69.5
47	45.6	11.4	07	103.8	26.0	67	162.0	40.6	27	220.2	55.2	87	278.4	69.7
48	46.6	11.7	08	104.8	26.2	68	163.0	40.8	28	221.2	55.4	88	279.4	70.0
49	47.5	11.9	09	105.7	26.5	69	163.9	41.1	29	222.1	55.6	89	280.3	70.2
50	48.5	12.2	110	106.7	26.7	70	164.9	41.3	30	223.1	55.9	290	281.3	70.5
51	49.5	12.4	111	107.7	27.0	171	165.9	41.6	231	224.1	56.1	291	282.3	70.7
52	50.4	12.6	12	108.6	27.2	72	166.8	41.8	32	225.0	56.4	92	283.2	71.0
53	51 4	12.9	13	109.6	27.5	73	167.8	42.0	33	226.0	56.6	93	284.2	71.2
54	52.4	13.1	14	110.6	27.7	74	168.8	42.3	34	227.0	56.9	94	285.2	71.4
55	53.4	13.4	15	111.6	27.9	75	169.8	42.5	35	228.0	57.1	95	286.2	71.7
56	54.3	13.6	16	112.5	28.2	76	170.7	42.8	36	228.9	57.3	96	287.1	71.9
57	55.3	13.9	17	113.5	28.4	77	171.7	43.0	37	229.9	57.6	97	288.1	72.2
58	56.3	14.1	18	114.5	28.7	78	172.7	43.3	38	230.9	57.8	98	289.1	72.4
59	57.2	14.3	19	115.4	28.9	79	173.6	43.5	39	231.8	58.1	99	290 0	72.7
60	58.2	14.6	120	116.4	29.2	80	174.6	43.7	40	232.8	58.3	300	291.0	72.9
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 6 3/4 Points.

TABLE II. Difference of Latitude and Departure for $1\frac{1}{2}$ Point.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.3	61	58 4	17.7	121	115.8	35.1	181	173.2	52.5	241	230.6	69.9
2	01.9	00.6	62	59.3	18.0	22	116.8	35.4	82	174.2	52.8	42	231.6	70.2
3	02.9	00.9	63	60.3	18.3	23	117.7	35.7	83	175.1	53.1	43	232.5	70.5
4	03.8	01.2	64	61.2	18.6	24	118.7	36.0	84	176.1	53.4	44	233.5	70.8
5	04.8	01.5	65	62.2	18.9	25	119.6	36.3	85	177.0	53.7	45	234.5	71.0
6	05.7	01.7	66	63.2	19.1	26	120.6	36.5	86	178.0	53.9	46	235.4	71.3
7	06.7	02.0	67	64.1	19.4	27	121.5	36.8	87	179.0	54.2	47	236.4	71.6
8	07.7	02.3	68	65.1	19.7	28	122.5	37.1	88	179.9	54.5	48	237.3	71.9
9	08.6	02.6	69	66.0	20.0	29	123.5	37.4	89	180.9	54.8	49	238.3	72.2
10	09.6	02.9	70	67.0	20.3	30	124.4	37.7	90	181.8	55.1	50	239.2	72.5
11	10.5	03.2	71	67.9	20.6	131	125.4	38.0	191	182.8	55.4	251	240.2	72.8
12	11.5	03.5	72	68.9	20.9	32	126.3	38.3	92	183.7	55.7	52	241.2	73.1
13	12.4	03.8	73	69.9	21.2	33	127 3	38.6	93	184.7	56.0	53	242.1	73.4
14	13.4	04.1	74	70.8	21.5	34	128.2	38.9	94	185.7	56.3	54	243.1	73.7
15	14.4	04.4	75	71.8	21.8	35	129.2	39.2	95	186.6	56.6	55	244.0	74.0
16	15.3	04.6	76	72.7	22.0	36	130.2	39.4	96	187.6	56.8	56	245.0	74.2
17	16.3	04.9	77	73.7	22.3	37	131.1	39.7	97	188.5	57.1	57	245.9	74.5
18	17.2	05.2	78	74.6	22.6	38	132.1	40.0	98	189.5	57.4	58	246.9	74.8
19	18.2	05.5	79	75.6	22.9	39	133.0	40.3	99	190.4	57.7	59	247.9	75.1
20	19.1	05.8	80	76.6	23.2	40	134.0	40.6	200	191.4	58.0	60	248.8	75.4
21	20.1	06.1	81	77.5	23.5	141	134.9	40.9	201	192.4	58.3	261	249.8	75.7
22	21.1	06.4	82	78.5	23.8	42	135.9	41.2	02	193.3	58.6	62	250.7	76.0
23	22.0	06.7	83	79.4	24.1	43	136.9	41.5	03	194.3	58.9	63	251.7	76.3
24	23.0	07.0	84	80.4	24.4	44	137.8	41.8	04	195.2	59.2	64	252.6	76.6
25	23.9	07.3	85	81.3	24.7	45	138.8	42.1	05	196.2	59.5	65	253.6	76.9
26	24.9	07.5	86	82.3	24.9	46	139.7	42.3	06	197.1	59.7	66	254.6	77.1
27	25.8	07.8	87	83.3	25.2	47	140.7	42.6	07	198.1	60.0	67	255.5	77.4
28	26.8	08.1	88	84.2	25.5	48	141.6	42.9	08	199.1	60.3	68	256.5	77.7
29	27.8	08.4	89	85.2	25.8	49	142.6	43.2	09	200.0	60.6	69	257.4	78.0
30	28.7	08.7	90	86.1	26.1	50	143.5	43.5	10	201.0	60.9	70	258.4	78.3
31	29.7	09.0	91	87.1	26.4	151	144.5	43.8	211	201.9	61.2	271	259.3	78.6
32	30.6	09.3	92	88.0	26.7	52	145.5	44.1	12	202.9	61.5	72	260.3	78.9
33	31.6	09.6	93	89.0	27.0	53	146.4	44.4	13	203.8	61.8	73	261.3	79.2
34	32.5	09.9	94	90.0	27.3	54	147.4	44.7	14	204.8	62.1	74	262.2	79.5
35	33.5	10.2	95	90.9	27.6	55	148.3	45.0	15	205.8	62.4	75	263.2	79.8
36	34.5	10.4	96	91.9	27.8	56	149.3	45.2	16	206.7	62.6	76	264.1	80.0
37	35.4	10.7	97	92.8	28.1	57	150.2	45.5	17	207.7	62.9	77	265.1	80.3
38	36.4	11.0	98	93.8	28.4	58	151.2	45.8	18	208.6	63.2	78	266.0	80.6
39	37.3	11.3	99	94.7	28.7	59	152.2	46.1	19	209.6	63.5	79	267.0	80.9
40	38.3	11.6	100	95.7	29.0	60	153.1	46.4	20	210.5	63.8	80	268.0	81.2
41	39.2	11.9	101	96.7	29.3	161	154.1	46.7	221	211.5	64.1	281	268.9	81.5
42	40.2	12.2	02	97.6	29.6	62	155.0	47.0	22	212.5	64.4	82	269.9	81.8
43	41.2	12.5	03	98.6	29.9	63	156.0	47.3	23	213.4	64.7	83	270.8	82.1
44	42.1	12.8	04	99.5	30.2	64	156.9	47.6	24	214.4	65.0	84	271.8	82.4
45	43.1	13.1	05	100.5	30.5	65	157.9	47.9	25	215.3	65.3	85	272.7	82.7
46	44.0	13.3	06	101.4	30.7	66	158.9	48.1	26	216.3	65.5	86	273.7	82.9
47	45.0	13.6	07	102.4	31.0	67	159.8	48.4	27	217.2	65.8	87	274.7	83.2
48	45.9	13.9	08	103.4	31.3	68	160.8	48.7	28	218.2	66.1	88	275.6	83.5
49	46.9	14.2	09	104.3	31.6	69	161.7	49.0	29	219.2	66.4	89	276.7	83.8
50	47.9	14.5	10	105 3	31.9	70	162.7	49.3	30	220.1	66.7	90	277.5	84.1
51	48.8	14.8	111	106.2	32.2	171	163.6	49.6	231	221.1	67.0	291	278.5	84.4
52	49.8	15.1	12	107.2	32.5	72	164.6	49.9	32	222.0	67.3	92	279.4	84.7
53	50.7	15.4	13	108.1	32.8	73	165.6	50.2	33	223.0	67.6	93	280.4	85.0
54	51.7	15.7	14	109.1	33.1	74	166 5	50.5	34	223.9	67.9	94	281.4	85.3
55	52.6	16.0	15	110.1	33.4	75	167.5	50.8	35	224.9	68.2	95	282.3	85.6
56	53.6	16.2	16	111.0	33.6	76	168.4	51.0	36	225.9	68.4	96	283.3	85.8
57	54.5	16.5	17	112.0	33.9	77	169.4	51.3	37	226.8	68.7	97	284.2	86.1
58	55.5	16.8	18	112.9	34.2	78	170.3	51.6	38	227.8	69.0	98	285.2	86.4
59	56.5	17.1	19	113.9	34.5	79	171.3	51.9	39	228.7	69.3	99	286.1	86.7
60	57.4	17.4	20	114.8	34.8	80	172.3	52.2	40	229.7	69.6	300	287.1	87.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for $6\frac{1}{2}$ Points.

Table II. Difference of Latitude and Departure for 1 ¾ Point.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.3	61	57.4	20.5	121	113.9	40.8	181	170 4	61.0	241	226.9	81.2
2	01.9	00.7	62	58.4	20.9	22	114.9	41.1	82	171.4	61.3	42	227.8	81.5
3	02.8	01.0	63	59.3	21.2	23	115.8	41.4	83	172.3	61.6	43	228.8	81.8
4	03.8	01.3	64	60.3	21.6	24	116.7	41.8	84	173.2	62.0	44	229.7	82.2
5	04.7	01.7	65	61.2	21.9	25	117.7	42.1	85	174.2	62.3	45	230.7	82.5
6	05.6	02.0	66	62.1	22.2	26	118.6	42.4	86	175.1	62.6	46	231.6	82.9
7	06.6	02.4	67	63.1	22.6	27	119.6	42.8	87	176.1	63.0	47	232.5	83.2
8	07.5	02.7	68	64.0	22.9	28	120.5	43.1	88	177.0	63.3	48	233.5	83.5
9	08.5	03.0	69	65.0	23.2	29	121.5	43.4	89	177.9	63.7	49	234.4	83.9
10	09.4	03.4	70	65.9	23.6	30	122.4	43.8	90	178.5	64.0	50	235.4	84.2
11	10.4	03.7	71	66.8	23.9	131	123.3	44.1	191	179.8	64.3	251	236.3	84.5
12	11.3	04.0	72	67.8	24.2	32	124.3	44.5	92	180.8	64.7	52	237.3	84.9
13	12.2	04.4	73	68.7	24.6	33	125.2	44.8	93	181.7	65.0	53	238.2	85.2
14	13.2	04.7	74	69.7	24.9	34	126.2	45.1	94	182.6	65.3	54	239.1	85.5
15	14.1	05.1	75	70.6	25.3	35	127.1	45.5	95	183.6	65.7	55	240.1	85.9
16	15.1	05.4	76	71.6	25.6	36	128.0	45.8	96	184.5	66.0	56	241.0	86.2
17	16.0	05.7	77	72.5	25.9	37	129.0	46.1	97	185 5	66.3	57	242.0	86.6
18	17.0	06.1	78	73.4	26.3	38	129.9	46.5	98	186.4	66.7	58	242.9	86.9
19	17.9	06.4	79	74.4	26.6	39	130.9	46.8	99	187.4	67.0	59	243.8	87.2
20	18.8	06.7	80	75.3	26.9	40	131.8	47.2	200	188.3	67.4	60	244.8	87.6
21	19.8	07.1	81	76.3	27.3	141	132.8	47.5	201	189.2	67.7	261	245.7	87.9
22	20.7	07.4	82	77.2	27.6	42	133.7	47.8	02	190.2	68.0	62	246.7	88.2
23	21.7	07.7	83	78.1	28.0	43	134.6	48.2	03	191.1	68.4	63	247.6	88.6
24	22.6	08.1	84	79.1	28.3	44	135.6	48.5	04	192.1	68.7	64	248.6	88.9
25	23.5	08.4	85	80.0	28.6	45	136.5	48.8	05	193.0	69.0	65	249.5	89.2
26	24.5	08.8	86	81.0	29.0	46	137.5	49.2	06	194.0	69.4	66	250.4	89.6
27	25.4	09.1	87	81.9	29.3	47	138.4	49.5	07	194.9	69.7	67	251.4	89.9
28	26.4	09.4	88	82.8	29.6	48	139.3	49.8	08	195.8	70.1	68	252.3	90.3
29	27.3	09.8	89	83.8	30.0	49	140.3	50.2	09	196.8	70.4	69	253.3	90.6
30	28.2	10.1	90	84.7	30.3	50	141.2	50.5	10	197.7	70.7	70	254.2	90.9
31	29.2	10.4	91	85.7	30.6	151	142.2	50.9	211	198.7	71.1	271	255.1	91.3
32	30.1	10.8	92	86.6	31.0	52	143.1	51.2	12	199.6	71.4	72	256.1	91.6
33	31.1	11.1	93	87.6	31.3	53	144.0	51.5	13	200.5	71.7	73	257.0	91.9
34	32.0	11.5	94	88.5	31.7	54	145.0	51.9	14	201.5	72.1	74	258.0	92.3
35	33.0	11.8	95	89.4	32.0	55	145.9	52.2	15	202.4	72.4	75	258.9	92.6
36	33.9	12.1	96	90.4	32.3	56	146.9	52.5	16	203.4	72.7	76	259.9	93.0
37	34.8	12.5	97	91.3	32.7	57	147.8	52.9	17	204.3	73.1	77	260.8	93.3
38	35.8	12.8	98	92.3	33.0	58	148.8	53.2	18	205.2	73.4	78	261.7	93.6
39	36.7	13.1	99	93.2	33.3	59	149.7	53.6	19	206.2	73.8	79	262.7	94.0
40	37.7	13.5	100	94.2	33.7	60	150.6	53.9	20	207.1	74.1	80	263.6	94.3
41	38.6	13.8	101	95.1	34.0	161	151.6	54.2	221	208.1	74.4	281	264.6	94.6
42	39.5	14.1	02	96.0	34.4	62	152.5	54.6	22	209.0	74.8	82	265.5	95.0
43	40.5	14.5	03	97.0	34.7	63	153.5	54.9	23	210.0	75.1	83	266.4	95.3
44	41.4	14.8	04	97.9	35.0	64	154.4	55.2	24	210.9	75.4	84	267.4	95.6
45	42.4	15.2	05	98.9	35.4	65	155.3	55.6	25	211.8	75.8	85	268.3	96.0
46	43.3	15.5	06	99.8	35.7	66	156.3	55.9	26	212.8	76.1	86	269.3	96.3
47	44.3	15.8	07	100.8	36.0	67	156.2	56.2	27	213.7	76.5	87	270.2	96.7
48	45.2	16.2	08	101.7	36.4	68	158.2	56.6	28	214.7	76.8	88	271.2	97.0
49	46.1	16.5	09	102.7	36.7	69	159.1	56.9	29	215.6	77.1	89	272.1	97.3
50	47.1	16.8	10	103.6	37.0	70	160.1	57.3	30	216.5	77.5	90	273.0	97.7
51	48.0	17.2	111	104.5	37.4	171	161.0	57.6	231	217.5	77.8	291	274.0	98.0
52	49.0	17.5	12	105.4	37.7	72	161.9	57.9	32	218.4	78.1	92	274.9	98.3
53	49.9	17.9	13	106.4	38.1	73	162.9	58.3	33	219.4	78.5	93	275.9	98.7
54	50.8	18.2	14	107.3	38.4	74	163.8	58.6	34	220.3	78.8	94	276.8	99.0
55	51.8	18.5	15	108 3	38.7	75	164.8	58.9	35	221.3	79.1	95	277.7	99.4
56	52.7	18.9	16	109.2	39.1	76	165.7	59.3	36	222.2	79.5	96	278.7	99.7
57	53.7	19.2	17	110.2	39.4	77	166.6	59.6	37	223.1	79.8	97	279.6	100.0
58	54.6	19.5	18	111.1	39.7	78	167.6	60.0	38	224.1	80.2	98	280.6	100.4
59	55.5	19.9	19	112.0	40.1	79	168.5	60.3	39	225.0	80.5	99	281.5	100.7
60	56.5	20.2	20	113.0	40.4	80	169.5	60.6	40	226.0	80.8	300	282.5	101.0

Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat	Dist	Dep.	Lat.

for 6½ Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.4	61	56.4	23.3	121	111.8	46.3	181	167.2	69.3	241	222.7	92.2
2	01.8	00.8	62	57.3	23.7	22	112.7	46.7	82	168.2	69.7	42	223.6	92.6
3	02.8	01.1	63	58.2	24.1	23	113.6	47.1	83	169.1	70.0	43	224.5	93.0
4	03.7	01.5	64	59.1	24.5	24	114.6	47.5	84	170.0	70.4	44	225.5	93.4
5	04.6	01.9	65	60.1	24.9	25	115.5	47.8	85	170.9	70.8	45	226.4	93.8
6	05.5	02.3	66	61.0	25.3	26	116.4	48.2	86	171.9	71.2	46	227.3	94.1
7	06.5	02.7	67	61.9	25.6	27	117.3	48.6	87	172.8	71.6	47	228.2	94.5
8	07.4	03.1	68	62.8	26.0	28	118.3	49.0	88	173.7	72.0	48	229.1	94.9
9	08.3	03.4	69	63.8	26.4	29	119.2	49.4	89	174.6	72.3	49	230.1	95.3
10	09.2	03.8	70	64.7	26.8	30	120.1	49.8	90	175.6	72.7	50	231.0	95.7
11	10.0	04.2	71	65.6	27.2	131	121.0	50.1	191	176.5	73.1	251	231.9	96.1
12	11.1	04.6	72	66.5	27.6	32	122.0	50.5	92	177.4	73.5	52	232.8	96.4
13	12.0	05.0	73	67.5	27.9	33	122.9	50.9	93	178.3	73.9	33	233.8	96.8
14	12.9	05.4	74	68.4	28.3	34	123.8	51.3	94	179.2	74.2	54	234.7	97.2
15	13.8	05.7	75	69.3	28.7	35	124.7	51.7	95	180.2	74.6	55	235.6	97.6
16	14.8	06.1	76	70.2	29.1	36	125.7	52.0	96	181.1	75.0	56	236.5	98.0
17	15.7	06.5	77	71.1	29.5	37	126.6	52.4	97	182.0	75.4	57	237.5	98.4
18	16.6	06.9	78	72.1	29.9	38	127.5	52.8	98	182.9	75.8	58	238.4	98.7
19	17.6	07.3	79	73.0	30.2	39	128.4	53.2	99	183.9	76.2	59	239.3	99.1
20	18.5	07.7	80	73.9	30.6	40	129.4	53.6	200	184.8	76.5	60	240.2	99.5
21	19.4	08.0	81	74.8	31.0	141	130.3	54.0	201	185.7	76.9	261	241.1	99.9
22	20.3	08.4	82	75.8	31.4	42	131.2	54.3	02	186.6	77.3	62	242.1	100.3
23	21.3	08.8	83	76.7	31.8	43	132.1	54.7	03	187.6	77.7	63	243.0	100.7
24	22.2	09.2	84	77.6	32.1	44	133.0	55.1	04	188.5	78.1	64	243.9	101.0
25	23.1	09.6	85	78.5	32.5	45	134.0	55.5	05	189.4	78.5	65	244.8	101.4
26	24.0	10.0	86	79.5	32.9	46	134.9	55.9	06	190.3	78.8	66	245.8	101.8
27	24.9	10.3	87	80.4	33.3	47	135.8	56.3	07	191.3	79.2	67	246.7	102.2
28	25.9	10.7	88	81.3	33.7	48	136.7	56.6	08	192.2	79.6	68	247.6	102.6
29	26.8	11.1	89	82.2	34.1	49	137.7	57.0	09	193.1	80.0	69	248.5	103.0
30	27.7	11.5	90	83.2	34.4	50	138.6	57.4	10	194.0	80.4	70	249.5	103.3
31	28.6	11.9	91	84.1	34.8	151	139.5	57.8	211	194.9	80.8	271	250.4	103.7
32	29.6	12.2	92	85.0	35.2	52	140.4	58.2	12	195.9	81.1	72	251.3	104.1
33	30.5	12.6	93	85.9	35.6	53	141.4	58.6	13	196.8	81.5	73	252.2	104.5
34	31.4	13.0	94	86.9	36.0	54	142.3	58.9	14	197.7	81.9	74	253.2	104.9
35	32.3	13.4	95	87.8	36.4	55	143.2	59.3	15	198.6	82.3	75	254.1	105.2
36	33.3	13.8	96	88.7	36.7	56	144.1	59.7	16	199.6	82.7	76	255.0	105.6
37	34.2	14.2	97	89.6	37.1	57	145.1	60.1	17	200.5	83.0	77	255.9	106.0
38	35.1	14.5	98	90.6	37.5	58	146.0	60.5	18	201.5	83.4	78	256.9	106.4
39	36.0	14.9	99	91.5	37.9	59	146.9	60.9	19	202.3	83.8	79	257.8	106.8
40	37.0	15.3	100	92.4	38.3	60	147.8	61.2	20	203.3	84.2	80	258.7	107.2
41	37.9	15.7	101	93.3	38.7	161	148.8	61.6	221	204.2	84.6	281	259.6	107.5
42	38.8	16.1	02	94.1	39.0	62	149.7	62.0	22	205.1	85.0	82	260.6	107.9
43	39.7	16.5	03	95.1	39.4	63	150.6	62.4	23	206.0	85.3	83	261.5	108.3
44	40.6	16.8	04	96.1	39.8	64	151.5	62.8	24	207.0	85.7	84	262.4	108.7
45	41.6	17.2	05	97.0	40.2	65	152.5	63.1	25	207.9	86.1	85	263.3	109.1
46	42.5	17.6	06	97.9	40.6	66	153.4	63.5	26	208.8	86.5	86	264.2	109.5
47	43.4	18.0	07	98.9	41.0	67	154.3	63.9	27	209.7	86.9	87	265.2	109.8
48	44.4	18.4	08	99.8	41.3	68	155.2	64.3	28	210.7	87.3	88	266.1	110.2
49	45.3	18.8	09	100.7	41.7	69	156.1	64.7	29	211.6	87.6	89	267.0	110.6
50	46.2	19.1	10	101.6	42.1	70	157.1	65.1	30	212.5	88.0	90	267.9	111.0
51	47.1	19.5	111	102.6	42.5	171	158.0	65.4	231	213.4	88.4	291	268.9	111.4
52	48.0	19.9	12	103.5	42.9	72	158.9	65.8	32	214.4	88.8	92	269.8	111.8
53	49.0	20.3	13	104.4	43.2	73	159.8	66.2	33	215.3	89.2	93	270.7	112.1
54	49.9	20.7	14	105.3	43.6	74	160.8	66.6	34	216.2	89.6	94	271.6	112.5
55	50.8	21.0	15	106.3	44.0	75	161.7	67.0	35	217.1	89.9	95	272.6	112.9
56	51.7	21.4	16	107.2	44.4	76	162.6	67.4	36	218.0	90.3	96	273.5	113.3
57	52.7	21.8	17	108.1	44.8	77	163.6	67.7	37	219.0	90.7	97	274.4	113.7
58	53.6	22.2	18	109.0	45.2	78	164.5	68.1	38	219.9	91.1	98	275.3	114.0
59	54.5	22.6	19	109.9	45.5	79	165.4	68.5	39	220.8	91.5	99	276.3	114.4
60	55.4	23.0	20	110.9	45.9	80	166.3	68.9	40	221.7	91.9	300	277.2	114.8

Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.0	00.4	61	55.1	26.1	121	109.4	51.7	181	163.6	77.4	241	217.8	103.0
2	01.8	00.9	62	56.0	26.5	22	110.3	52.2	82	164.5	77.8	42	218.7	103.5
3	02.7	01.3	63	57.0	26.9	23	111.2	52.6	83	165.4	78.2	43	219.6	103.9
4	03.6	01.7	64	57.9	27.4	24	112.1	53.0	84	166.3	78.7	44	220.5	104.3
5	04.5	02.1	65	58.8	27.8	25	113.0	53.5	85	167.2	79.1	45	221.4	104.8
6	05.4	02.6	66	59.7	28.2	26	113.9	53.9	86	168.1	79.5	46	222.4	105.2
7	06.3	03.0	67	60.6	28.6	27	114.8	54.3	87	169.0	80.0	47	223.3	105.6
8	07.2	03.4	68	61.5	29.1	28	115.7	54.7	88	169.9	80.4	48	224.2	106.0
9	08.1	03.8	69	62.4	29.5	29	116.6	55.2	89	170.8	80.8	49	225.1	106.5
10	09.0	04.3	70	63.3	29.9	30	117.5	55.6	90	171.7	81.2	50	226.0	106.9
11	09.9	04.7	71	64.2	30.4	131	118.4	56.0	191	172.6	81.7	251	226.9	107.3
12	10.8	05.1	72	65.1	30.8	32	119.3	56.4	92	173.6	82.1	52	227.8	107.8
13	11.8	05.6	73	66.0	31.2	33	120.2	56.9	93	174.5	82.5	53	228.7	108.2
14	12.7	06.0	74	66.9	31.6	34	121.1	57.3	49	175.4	83.0	54	229.6	108.6
15	13.6	06.4	75	67.8	32.1	35	122.0	57.7	95	176.3	83.4	55	230.5	109.0
16	14.5	06.8	76	68.7	32.5	36	122.9	58.2	96	177.2	83.8	56	231.4	109.5
17	15.4	07.3	77	69.6	32.9	37	123.8	58.6	97	178.1	84.2	57	232.3	109.9
18	16.3	07.7	78	70.5	33.4	38	124.7	59.0	98	179.0	84.7	58	233.2	110.3
19	17.2	08.1	79	71.4	33.8	39	125.6	59.4	99	179.9	85.1	59	234.1	110.7
20	18.1	08.6	80	72.3	34.2	40	126.5	59.9	200	180.8	85.5	60	235.0	111.2
21	19.0	09.0	81	73.2	34.6	141	127.4	60.3	201	181.7	85.9	261	235.9	111.6
22	19.9	09.4	82	74.1	35.1	42	128.4	60.7	02	182.6	86.4	62	236.8	112.0
23	20.8	09.8	83	75.0	35.5	43	129.3	61.1	03	183.5	86.8	63	237.7	112.5
24	21.7	10.3	84	75.9	35.9	44	130.2	61.6	04	184.4	87.2	64	238.6	112.9
25	22.6	10.7	85	76.8	36.3	45	131.2	62.0	05	185.3	87.7	65	239.5	113.3
26	23.5	11.1	86	77.7	36.8	46	132.0	62.4	06	186.2	88.1	66	240.4	113.7
27	24.4	11.5	87	78.6	37.2	47	132.9	62.9	07	187.1	88.5	67	241.3	114.2
28	25.3	12.0	88	79.6	37.6	48	133.8	63.3	08	188.0	88.9	68	242.2	114.6
29	26.2	12.4	89	80.5	38.1	49	134.7	63.7	09	188.9	89.4	69	243.1	115.0
30	27.1	12.8	90	81.4	38.5	50	135.6	64.1	10	189.8	89.8	70	244.0	115.5
31	28.0	13.3	91	82.3	38.9	151	136.5	64.6	211	190.7	90.2	271	245.0	115.9
32	28.9	13.7	92	83.2	39.3	52	137.4	65.0	12	191.6	90.6	72	245.9	116.3
33	29.8	14.1	93	84.1	39.8	53	138.3	65.4	13	192.5	91.1	73	246.8	116.7
34	30.7	14.5	94	85.0	40.2	54	139.2	65.8	14	193.4	91.5	74	247.7	117.2
35	31.6	15.0	95	85.9	40.6	55	140.1	66.3	15	194.3	91.9	75	248.6	117.6
36	32.5	15.4	96	86.8	41.0	56	141.0	66.7	16	195.2	92.4	76	249.5	118.0
37	33.4	15.8	97	87.7	41.5	57	141.9	67.1	17	196.1	92.8	77	250.4	118.4
38	34.4	16.2	98	88.6	41.9	58	142.8	67.6	18	197.0	93.2	78	251.3	118.9
39	35.3	16.7	99	89.5	42.3	59	143.7	68.0	19	197.9	93.6	79	252.2	119.3
40	36.2	17.1	100	90.4	42.8	60	144.6	68.4	20	198.8	94.1	80	253.1	119.7
41	37.1	17.5	101	91.3	43.2	161	145.5	68.8	221	199.8	94.5	281	254.0	120.2
42	38.0	18.0	02	92.2	43.6	62	146.4	69.3	22	200.7	94.9	82	254.9	120.6
43	38.9	18.4	03	93.1	44.0	63	147.3	69.7	23	201.6	95.4	83	255.8	121.0
44	39.8	18.8	04	94.0	44.5	64	148.2	70.1	24	202.5	95.8	84	256.7	121.4
45	40.7	19.2	05	94.9	44.9	65	149.1	70.6	25	203.4	96.2	85	257.6	121.9
46	41.6	19.7	06	95.8	45.3	66	150.0	71.0	26	204.3	96.6	86	258.5	122.3
47	42.5	20.1	07	96.7	45.8	67	151.0	71.4	27	205.2	97.1	87	259.4	122.7
48	43.4	20.5	08	97.6	46.2	68	151.9	71.8	28	206.1	97.5	88	260.3	123.1
49	44.3	21.0	09	98.5	46.6	69	152.8	72.3	29	207.0	97.9	89	261.2	123.6
50	45.2	21.4	10	99.4	47.0	70	153.7	72.7	30	207.9	98.3	90	262.1	124.0
51	46.1	21.8	111	100.3	47.5	171	154.6	73.1	231	208.8	98.8	291	263.0	124.4
52	47.0	22.2	12	101.2	47.9	72	155.5	73.5	32	209.7	99.2	92	263.9	124.9
53	47.9	22.7	13	102.1	48.3	73	156.4	74.0	33	210.6	99.6	93	264.8	125.3
54	48.8	23.1	14	103.0	48.7	74	157.3	74.4	34	211.5	100.1	94	265.7	125.7
55	49.7	23.5	15	103.9	49.2	75	158.2	74.8	35	212.4	100.5	95	266.6	126.1
56	50.6	23.9	16	104.8	49.6	76	159.1	75.3	36	213.3	100.9	96	267.6	126.6
57	51.5	24.4	17	105.8	50.0	77	160.0	75.7	37	214.2	101.3	97	268.5	127.0
58	52.4	24.8	18	106.7	50.5	78	160.9	76.1	38	215.1	101.8	98	269.4	127.4
59	53.3	25.2	19	107.6	50.9	79	161.8	76.5	39	216.0	102.2	99	270.3	127.8
60	54.2	25.7	20	108.5	51.3	80	162.7	77.0	40	216.9	102.6	300	271.2	128.3
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE II. Difference of Latitude and Departure for 2 ½ Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.8	28.7	121	106.7	57.0	181	159.6	85.3	241	212.6	113.5
2	01.8	00.9	62	54.7	29.2	22	107.6	57.5	82	160.5	85.8	42	213.4	114.0
3	02.6	01.4	63	55.6	29.7	23	108.5	58.0	83	161.4	86.2	43	214.3	114.5
4	03.5	01.9	64	56.4	30.2	24	109.4	58.4	84	162.3	86.7	44	215.2	115.0
5	04.4	02.4	65	57.3	30.6	25	110.3	58.9	85	163.2	87.2	45	216.1	115.4
6	05.3	02.8	66	58.2	31.1	26	111.2	59.4	86	164.1	87.6	46	217.0	115.9
7	06.2	03.3	67	59.1	31.6	17	112.1	59.8	87	164.9	88.1	47	217.9	116.4
8	07.1	03.8	68	60.0	32.0	28	112.9	60.3	88	165.8	88.6	48	218.7	116.8
9	07.9	04.2	69	60.9	32.5	29	113.8	60.8	89	166.7	89.1	49	219.6	117.3
10	08.8	04.7	70	61.7	33.0	30	114.7	61.3	90	167.6	89.5	50	220.5	117.8
11	09.7	05.2	71	62.6	33.5	131	115.5	61.7	191	168.5	90.0	251	221.4	118.3
12	10.6	05.7	72	63.5	33.9	32	116.4	62.2	92	169.3	90.5	52	222.3	118.7
13	11.5	06.1	73	64.4	34.4	33	117.3	62.7	93	170.2	90.9	53	223.1	119.2
14	12.3	06.6	74	65.3	34.9	34	118.2	63.1	94	171.1	91.4	54	224.0	119.7
15	13.2	07.1	75	66.2	35.3	35	119.1	63.6	95	172.0	91.9	55	224.9	120.1
16	14.1	07.5	76	67.0	35.8	36	120.0	64.5	96	172.9	92.4	56	225.8	120.6
17	15.0	08.0	77	67 9	36.3	37	120.8	64.6	97	173.8	92.8	57	226 7	121.1
18	15.9	08.5	78	68.8	36.8	38	121.7	65.0	98	174.6	93.3	58	227 6	121.6
19	16.8	09.0	79	69.7	37.2	39	122.6	65.5	99	175.5	93.8	59	228.4	122.0
20	17.6	09.4	80	70.6	37.7	40	123.5	66.0	200	176.4	94.2	60	229.3	122.5
21	18.5	09.9	81	71.4	38.2	141	124.4	66.4	201	177.3	94 7	261	230.2	123.0
22	19.4	10.4	82	72.3	38.6	42	125.2	66.9	02	178.2	95.2	62	231.1	123.4
23	20.3	10.8	83	73.2	39.1	43	126.1	67.4	03	179.0	95.6	63	232.0	123.9
24	21.2	11.3	84	74.1	39.6	44	127.0	67.8	04	179.9	96.1	64	232.8	124.4
25	22.1	11.8	85	75.0	40.1	45	127.9	68.3	05	180.0	96.6	65	233.7	124.9
26	22.9	12.3	86	75.9	40.5	46	128.8	68.8	06	181.7	97.1	66	234.6	125.3
17	23.8	12.7	87	76.7	41.0	47	129.6	69.3	07	182.6	97.5	67	235.5	125.8
28	24.7	13.2	88	77.6	41.5	48	130.5	69.7	08	183.5	98.0	68	236.4	126.3
29	25.6	13.7	89	78.5	41.9	49	131.4	70.2	09	184.3	98.5	69	237.3	126.7
30	26.5	14.1	90	79.4	42.4	50	132.3	70.7	10	185.2	98.6	70	238.1	127.2
31	27.3	14.6	91	80.3	42.9	151	133.2	71.1	211	186.1	99.4	271	239.0	127.7
32	28.2	15.1	92	81.1	43.4	52	134.1	71.6	12	187.0	99.9	72	239.9	128.2
33	29.1	15.5	93	82.0	43.8	53	134.9	72.1	13	187 9	100.4	73	240.8	128.6
34	30.0	16.0	94	82 9	44.3	54	135.8	72.6	14	188.7	100.8	74	241.7	129.1
35	30.9	16.5	95	83.8	44.8	55	136.7	73.0	15	189.6	101.3	75	242.5	129.6
36	31.8	17.0	96	84.7	45.2	56	137.6	73.5	16	190.5	101.8	76	243.4	130.0
37	32.6	17.4	97	85.6	45.7	57	138.5	74.0	17	191.4	102.2	77	244.3	130.5
38	33.5	17.9	98	86.4	46.2	58	139.4	74.4	18	192.3	102.7	78	245.2	131.0
39	34.4	18.4	99	87.3	46.6	59	140.2	74.9	19	193.2	103.2	79	246.1	131.5
40	35.3	18.8	100	88.2	47.1	60	141.1	75.4	20	194.0	103.7	80	247.0	131.9
41	36.2	19.3	101	89.1	47.6	161	142.0	75.9	221	194.9	104.1	281	247.8	132.4
42	37.0	19.8	02	90.0	48.1	62	142.9	76.3	22	195.8	104.6	82	248.7	132.9
43	37.9	20.3	03	90.8	48.5	63	143.8	76.8	23	196.7	105.1	83	249.6	133.3
44	38.8	20.7	04	91.7	49.0	64	144.6	77.3	24	197.6	105.5	84	250.5	133.8
45	39.7	21.2	05	92.6	49.5	65	145.5	77.7	25	198.4	106.0	85	251.4	134.3
46	40.6	21.7	06	93.5	49.9	66	146.4	78.2	26	199.3	106.5	86	252.3	134.8
47	41.5	22.1	07	94.4	50.4	67	147.3	78.7	27	200.2	107.0	87	253.1	135.2
48	42.3	22.6	08	95.3	50.9	68	148.2	79.2	28	201.1	107.4	88	254.0	135.7
49	43.2	23.1	09	96.1	51.4	69	149.1	79.6	29	202.0	107.9	89	254.9	136.2
50	44.1	23.6	10	97.0	51.8	70	149.9	80.1	30	202.9	108.4	90	255.8	136.6
51	45.0	24.0	111	97.9	52.3	172	150.8	80.6	231	203.7	108.8	291	256.7	137.1
52	45.9	24.5	12	98.8	52.8	71	151.7	81.0	32	204.6	109.3	92	257.5	137.6
53	46.7	25.0	13	99.7	53.2	73	152.6	81.5	33	205.5	109.8	93	258.4	138.1
54	47.6	25.4	14	100.5	53.7	74	153.5	82.0	34	206.4	110.3	94	259.3	138.5
55	48.5	25.9	15	101.4	54.2	75	154.3	82.5	35	207.3	110.7	95	260.2	139.0
56	49.4	26.4	16	102.3	54.7	76	155.2	82.9	36	208.2	111.2	96	261.1	139.5
57	50.3	26.9	17	103.2	55.1	77	156.1	83.4	37	209.0	111.7	97	262.0	139.9
58	51.2	27.3	18	104 1	55.6	78	157.0	83.9	38	210.9	112.1	98	262.8	140.4
59	52.0	27.8	19	105.1	56.1	79	157.9	84.3	39	210.8	112.6	99	263.7	140.9
60	52.9	28.3	20	105.8	56.5	80	158.8	84.8	40	211.7	113.1	300	264.6	141.4
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat

for 5 ½ Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.6	61	52.3	31.4	121	103.8	62.2	181	155.2	93 0	241	206.7	123.9
2	01.7	01.0	62	53.2	31.9	22	104.6	62.7	82	156.1	93.5	42	207.6	124.4
3	02.6	01.5	63	54.0	32.4	23	105.5	63.2	83	157.0	94.0	43	208.4	124.9
4	03.4	02.1	64	54.9	32.9	24	106.4	63.7	84	157.8	94.6	44	209.3	125.4
5	04.3	02.6	65	55.8	33.4	25	107.2	64.2	85	158.7	95.1	45	210.1	125.9
6	05.1	03.1	66	56.6	33.9	26	108.1	64.8	86	159.5	95.6	46	211.0	126.4
7	06.0	03.6	67	57.5	34.4	27	108.9	65.3	87	160.4	96.1	47	211.9	126.9
8	06.9	04.1	68	58.3	35.0	28	109.8	65.8	88	161.2	96.6	48	212.7	127.4
9	07.7	04.6	69	59.2	35.5	29	110.6	66.3	89	162.1	97.2	49	213.6	128.0
10	08.6	05.1	70	60.0	36.0	30	111.5	66.8	90	163.0	97.7	50	214.4	128.5
11	09.4	05.7	71	60.9	36.5	131	112.4	67.3	191	163.8	98.2	251	215.3	129.0
12	10.3	06.2	72	61.8	37.0	32	113.2	67.8	92	164.7	98.7	52	216.1	129.5
13	11.2	06.7	73	62.6	37.6	33	114.1	68.4	93	165.5	99.2	53	217.0	130 0
14	12.0	07.2	74	63.5	38.1	34	114.9	68.9	94	166.4	99.7	54	217.9	130.5
15	12.9	07.7	75	64.3	38.6	35	115.8	69.4	95	167.3	100.2	55	218.7	131.0
16	13.7	08.2	76	65.2	39.1	36	116.6	69.9	96	168.1	100.7	56	219.6	131.5
17	14.6	08.7	77	66.0	39.6	37	117.5	70.4	97	169.0	101.2	57	220.4	132.1
18	15.4	09.3	78	66.9	40.1	38	118.4	70.9	98	169.8	101.8	58	221.3	132.6
19	16.3	09.8	79	67.8	40.6	39	119.2	71.4	99	170.7	102.3	59	222.1	133.1
20	17.2	10.3	80	68.6	41.1	40	120.1	72.0	200	171.5	102.8	60	223.0	133 6
21	18.0	10.8	81	69.5	41.6	141	120.9	72.5	201	172.4	103.3	261	223.9	134.1
22	18.9	11.3	82	70.3	42.2	42	121.8	73.0	02	173.3	103.8	62	224.7	134.6
23	19.7	11.8	83	71.2	42.7	43	122.7	73.5	03	174.1	104.3	63	225.6	135.7
24	20.6	12.3	84	72.0	43.2	44	123.5	74.0	04	175.0	104.8	64	226.4	135.7
25	21.4	12.9	85	72.9	43.7	45	124.4	74.6	05	175.8	105.4	65	227.3	136.2
26	22.3	13.4	86	73.8	44.2	46	125.2	75.1	06	176.7	105.9	66	228.1	136.7
27	23.2	13.9	87	74.6	44.7	47	126.1	75.6	07	177.5	106.4	67	229.0	137.2
28	24.0	14.4	88	75.5	45.2	48	126.9	76.1	08	178.4	106.9	68	229.9	137.7
29	24.9	14.9	89	76.3	45.7	49	127.8	76.6	09	179.3	107.4	69	230.7	138.2
30	25.7	15.4	90	77.2	46.3	50	128.7	77.1	10	180.1	107.9	70	231.6	138.8
31	26.6	15.9	91	78.1	46.8	151	129.5	77.6	211	181.0	108.4	271	232.4	139.3
32	27.4	16.4	92	78.9	47.3	52	130.4	78.1	12	181.8	109.0	72	233.3	139.8
33	28.3	17.0	93	79.8	47.8	53	131.2	78.6	13	182.7	109.5	73	234.2	140.3
34	29.2	17.5	94	80.6	48.3	54	132.1	79.1	14	183.5	110.0	74	235.0	140.8
35	30.0	18.0	95	81.5	48.8	55	132.9	79.7	15	184.4	110.5	75	235.9	141.3
36	30.9	18.5	96	82.3	49.3	56	133.8	80.2	16	185.3	111.0	76	236.7	141.8
37	31.7	19.0	97	83.2	49.9	57	134.7	80.7	17	186.1	111.5	77	237.6	142.4
38	32.6	19.5	98	84.1	50.4	58	135.5	81.2	18	187.0	112.0	78	238.4	142.9
39	33.5	20.0	99	84.9	50.9	59	136.4	81.7	19	187.8	112.6	79	239.3	143.4
40	34.3	20.6	100	85.8	51.4	60	137.2	82.2	20	188.7	113.1	80	240.2	143.9
41	35.2	21.1	101	86.6	51.9	161	138.1	82.7	221	189.6	113 6	281	241.0	144.4
42	36.0	21.6	02	87.5	52.4	62	138.9	83.3	22	190.4	114.1	82	241.9	144.9
43	36.9	22.1	03	88.3	52.9	63	139.8	83.8	23	191.3	114.6	83	242.7	145.4
44	37.7	22.6	04	89.2	53.4	64	140.7	84.3	24	192 1	115.1	84	243.6	146.0
45	38.6	23.1	05	90.1	54.0	65	141.5	84.8	25	193.0	115.6	85	244.4	146.5
46	39.5	23.6	06	90.9	54.5	66	142.4	85.3	26	193.8	116.1	86	245.3	147.0
47	40.3	24.2	07	91.8	55.0	67	143.2	85.8	27	194.7	116.7	87	246.2	147.5
48	41.2	24.7	08	92.6	55.5	68	144.1	86.3	28	195.6	117.2	88	247.0	148.0
49	42.0	25.2	09	93.5	56.0	69	145.0	86.9	29	196.4	117.7	89	247.9	148.5
50	42.9	25.7	10	94.3	56.5	70	145.8	87.4	30	197.3	118.2	90	248.7	149.0
51	43.7	26.2	111	95.2	57.0	171	146.7	87.9	231	198.1	118.7	291	249.6	149.6
52	44.6	26.7	12	96.1	57.6	72	147.5	88.4	32	199.0	119.2	92	250.4	150.1
53	45.5	27.2	13	96.9	58.1	73	148.4	88.9	33	199.8	119.7	93	251.3	150.6
54	46.3	27.8	14	97.8	58.6	74	149.2	89.4	34	200 7	120. 3	94	252.2	151.1
55	47.2	28.3	15	98.6	59.1	75	150.1	89.9	35	201.6	120.8	95	253.0	151.2
56	48.0	28.8	16	99.5	59.6	76	151.0	90.4	36	202.4	121.3	96	253.9	152.1
57	48.9	29.3	17	100.4	60.1	77	151.6	91.0	37	203.3	121.8	97	254.7	152.6
58	49.7	29.8	18	101.2	60.6	78	152.7	91.5	38	204.1	122.3	98	255 6	153.1
59	50.6	30.3	19	102.1	61.2	79	153.5	92.0	39	205.0	122.8	99	256.5	153.7
60	51.5	30.8	20	102.9	61.7	180	154.4	92.5	140	205.8	123.3	300	257.3	154.2
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

39 - 44
40 = 44 4/3

TABLE II. Difference of Latitude and Departure for 3 Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	50.7	33.9	121	100.6	67.2	181	150.5	100.5	241	200.4	133.9
2	01.7	01.1	62	51.5	34.4	22	101.4	67.8	82	151.3	101.1	42	201.2	134.4
3	02.5	01.7	63	52.4	35.0	23	102.3	68.3	83	152.1	101.7	43	202.0	135.0
4	03.3	02.2	64	53.2	35.6	24	103.1	68.9	84	153.0	102.2	44	202.8	135.5
5	04.2	02.8	65	54.0	36.1	25	103.9	69.4	85	153.8	102.8	45	203.7	136.1
6	05.0	03.3	66	54.9	36.7	26	104.8	70.0	86	154.6	103.3	46	204.5	136.7
7	05.8	03.9	67	55.7	37.2	27	105.6	70.5	87	155.5	103.9	47	205.3	137.2
8	06.7	04.4	68	56.5	37.8	28	106.4	71.1	88	156.3	104.4	48	206.2	137.8
9	07.5	05.0	69	57.4	38.3	29	107.2	71.7	89	157.1	105.0	49	207.0	138.3
10	08.3	05.6	70	58.2	38.9	30	108.1	72.2	90	158.0	105.5	50	207.8	138.9
11	09.1	06.1	71	59.0	39.4	131	108.9	72.8	191	158.8	106.1	251	208.7	139.4
12	10.0	06.7	72	59.9	40.0	32	109.7	73.3	92	159.6	106.7	52	209.5	140.0
13	10.8	07.2	73	60.7	40.6	33	110.6	73.9	93	160.4	107.2	53	210.3	140.5
14	11.6	07.8	74	61.5	41.1	34	111.4	74.4	94	161.3	107.8	54	211.2	141.1
15	12.5	08.3	75	62.4	41.7	35	112.2	75.0	95	162.1	108.3	55	212.0	141.7
16	13.3	08.9	76	63.2	42.2	36	113.1	75.5	96	162.9	108.9	56	212.8	142.2
17	14.1	09.4	77	64.0	42.8	37	113.9	76.1	97	163.8	109 4	57	213.7	142.8
18	15.0	10.0	78	64.8	43.3	38	114.7	76.7	98	164 6	110.0	58	214.5	143.3
19	15.8	10.6	79	65.7	43.9	39	115.6	77.2	99	165.4	110.5	59	215.3	143.9
20	16.6	11.1	80	66.5	44.4	40	116.4	77.8	200	166.3	111.1	60	216.1	144.4
21	17.5	11.7	81	67.3	45.0	141	117.2	78.3	201	167.1	111.7	261	217.0	145.0
22	18.3	12.2	82	68.2	45.6	42	118.1	78.9	02	167.9	112.2	62	217.8	145.5
23	19.1	12.8	83	69.0	46.1	43	118.9	79.4	03	168.8	112.8	63	218.6	146.1
24	20.0	13.3	84	69.8	46.7	44	119.7	80.0	04	169.6	113.3	64	219.5	146.7
25	20.8	13.9	85	70.7	47.2	45	120.5	80.5	05	170.4	113.9	65	220.3	147.2
26	21.6	14.4	86	71.5	47.8	46	121.4	81.1	06	171.3	114.4	66	221.1	147.8
27	22.4	15.0	87	72.3	48.3	47	122.2	81.7	07	172.1	115.0	67	222.0	148.3
28	23.3	15.6	88	73.2	48.9	48	123.0	82.2	08	172.9	115.5	68	222.8	148.9
29	24.1	16.1	89	74.0	49.4	49	123.9	82.8	09	173.8	116.1	69	223.6	149.4
30	24.9	16.7	90	74.8	50.0	50	124.7	83.3	10	174.6	116.7	70	224.5	150.0
31	25.8	17.2	91	75.7	50.6	151	125.5	83.9	211	175.4	117.2	271	225.3	150.5
32	26.6	17.8	92	76.5	51.1	52	126.4	84.4	12	176.2	117.8	72	226.1	151.1
33	27.4	18.3	93	77.3	51.7	53	127.2	85.0	13	177.1	118.3	73	227.0	151.7
34	28.3	18.9	94	78.1	52.2	54	128.0	85.5	14	177.9	118.9	74	227.8	152.2
35	29.1	19.4	95	79.0	52.8	55	128.9	86.1	15	178.7	119.4	75	228.6	152.8
36	29.9	20.0	96	79.8	53.3	56	129.7	86.7	16	179.6	120.0	76	229.4	153.3
37	30.8	20.6	97	80.6	53.9	57	130.5	87.2	17	180.4	120.5	77	230.3	153 9
38	31.6	21.1	98	81.5	54.4	58	131.4	87.8	18	181.2	121.1	78	231.1	154.4
39	32.4	21.7	99	82.3	55.0	59	132.2	88.3	19	182.1	121.7	79	231.9	155.0
40	33.3	22.2	100	83.1	55.6	60	133.0	88.9	20	182.9	122.2	80	232.8	155.5
41	34.1	22.8	101	84.0	56.1	161	133.8	89.4	221	183.7	122.8	281	233.6	156.1
42	34.9	23.3	02	84.8	56.7	62	134.7	90.0	22	184.6	123.3	82	234.4	156.7
43	35.8	23.9	03	85.6	57.2	63	135.5	90.5	23	185.4	123.9	83	235.3	157.2
44	36.6	24.4	04	86.5	57.8	64	136.3	91.1	24	186.2	124.4	84	236.1	157.8
45	37.4	25.0	05	87.3	58.3	65	137.2	91.7	25	187.1	125.0	85	236.9	158.3
46	38.2	25.6	06	88.1	58.9	66	138.0	92.2	26	187.9	125.5	86	237.8	158.9
47	39.1	26.1	07	89.0	59.4	67	138.8	92.8	27	188.7	126.1	87	238.6	159.4
48	39.9	26.7	08	89.8	60.0	68	139.7	93.3	28	189.5	126.7	88	239.4	160.0
49	40.7	27.2	09	90.6	60.5	69	140.5	93.9	29	190.4	127.2	89	240.3	160.5
50	41.6	27.8	10	91.4	61.1	70	141.3	94.4	30	191.2	127.8	90	241.1	161.1
51	42.4	28.3	111	92.3	61.7	171	142.2	95 0	231	192.0	128.3	291	241.9	161.7
52	43.2	28.9	12	93.1	62.2	72	143.0	95.5	32	192.9	128.9	92	242.8	162.2
53	44.1	29.4	13	93.9	62.8	73	143.8	96.1	33	193.7	129.4	93	243.6	162.8
54	44.9	30.0	14	94.9	63.3	74	144.7	96.7	34	194.5	130.0	94	244.4	163.3
55	45.7	30.6	15	95.6	63.9	75	145.5	97.2	35	195.4	130.5	95	245.2	163.9
56	46.6	31.1	16	96.4	64.4	76	146.3	97.8	36	196.2	131.1	96	246.1	164.4
57	47.4	31.7	17	97.3	65.0	77	147.1	98.3	37	197.0	131.7	97	246.9	165.0
58	48.2	32.2	18	98.1	65.5	78	148.0	98.9	38	197.9	132.2	98	247.7	165.5
59	49.1	32.8	19	98.9	66.1	79	148.8	99.4	39	198.7	132.8	99	248.5	166.1
60	49.9	33.3	120	99.8	66.7	180	149.6	100.0	140	199.5	133.3	300	249.4	166.7
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 5 Points.

TABLE II. Difference of Latitude and Departure for 3 ¼ Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	49.0	36 3	121	97.2	72.1	181	145.4	107.8	241	193.5	143.6
2	01.6	01.2	62	49.8	36.9	22	98.0	72.7	82	146.2	108.4	42	194.3	144.2
3	02.4	01.8	63	50.6	37.5	23	98.8	73.3	83	147.0	109 0	43	195.1	144.8
4	03.2	02.4	64	51.4	38.1	24	99.6	73.9	84	147.8	109.6	44	195.9	145.4
5	04.0	03.0	65	52.2	38 7	25	100.4	74.5	85	148.6	110.2	45	196.7	146.0
6	04.8	03.6	66	53.0	39.3	26	101.2	75.1	86	149.4	110.8	46	197.5	146.6
7	05.6	04.2	67	53.8	39.9	27	102.0	75.7	87	150.2	111.4	47	198.4	147.1
8	06.4	04.8	68	54.6	40.5	28	102.8	76.3	88	151.0	112.0	48	199.2	147.7
9	07.2	05.4	69	55.4	41.1	29	103.6	76.9	89	151.8	112.6	49	200.0	148.3
10	08.0	06.0	70	56.2	41.7	30	104.4	77.4	90	152.6	113.2	50	200 8	148.9
11	08.8	06.6	71	57.0	42.3	131	105.2	78.0	191	153.4	113.8	251	201.6	149.5
12	09.6	07.1	72	57.8	42.9	32	106.0	78.6	92	154.2	114.4	52	202.4	150.1
13	10.4	07.7	73	58.6	43.5	33	106.8	79.2	93	155.0	115.0	53	203.2	150.7
14	11.2	08.3	74	59.4	44.1	34	107.6	79 8	94	155.8	115.6	54	204.0	151.3
15	12.0	08.9	75	60.2	44.7	35	108.4	80.4	95	156.6	116.2	55	204.8	151.9
16	12.8	09.5	76	61.0	45.3	36	109.2	81.0	96	157.4	116 8	56	205.6	152.5
17	13.7	10.1	77	61.8	45.9	37	110.0	81.6	97	158.2	117.4	57	206.4	153.1
18	14.5	10.7	78	62.6	46.5	38	110.8	82.2	98	159.0	118 0	58	207.2	153.7
19	15.3	11.3	79	63.4	47.1	39	111.6	82.8	99	159.8	118.6	59	208.0	154.3
20	16.1	11.9	80	64.2	47.7	40	112.4	83.4	200	160.6	119.1	60	208.8	154.9
21	16.9	12.5	81	65.0	48.3	141	113.2	84.0	201	161.4	119.7	261	209.6	155.5
22	17.7	13.1	82	65.8	48.9	42	114.0	84.6	02	162.2	120.3	62	210.4	156.1
23	18.5	13.7	83	66.7	49.4	43	114.8	85.2	03	163.0	120.9	63	211.2	156.7
24	19.3	14.3	84	67.5	50.0	44	115.6	85.8	04	163.8	121.5	64	212.0	157.3
25	20.1	14.9	85	68.3	50.6	45	116.4	86.4	05	164.6	122.1	65	212.8	157.9
26	20.9	15.5	86	69.1	51.2	46	117 2	87.0	06	165.4	122.7	66	213.6	158.5
27	21.7	16.1	87	69.9	51.8	47	118.0	87.6	07	166.2	123.3	67	214.4	159.1
28	22.5	16.7	88	70.7	52.4	48	118.8	88.2	08	167.0	123.9	68	215.2	159.7
29	23.3	17.3	89	71.5	53.0	49	119.7	88.8	09	167.8	124.5	69	216.0	160.3
30	24.1	17 9	90	72.3	53.6	50	120.5	89.4	10	168.6	125.1	70	216.8	160.9
31	24.9	18.5	91	73.1	54.2	151	121.3	90.0	211	169.4	125.7	271	217 6	161.4
32	25.7	19.1	92	73.9	54.8	52	122 1	90.6	12	170.2	126.3	72	218.4	162.0
33	26.5	19.7	93	74.7	55.4	53	122.9	91.1	13	171.0	126.9	73	219.2	162.6
34	27.3	20.3	94	75.5	56.0	54	123.7	91.7	14	171.8	127.5	74	220.0	163.2
35	28.1	20.9	95	76.3	56.6	55	124 5	92.3	15	172.7	128.1	75	220.8	163.8
36	28.9	21.4	96	77.1	57.2	56	125.3	92.9	16	173.5	128.7	76	221.6	164.4
37	29.7	22.0	97	77.9	57.8	57	126 1	93.5	17	174.3	129.3	77	222.4	165.0
38	30.5	22.6	98	78.7	58.4	58	126.9	94.1	18	175.1	129 9	78	223.2	165.5
39	31.3	23.2	99	79.5	59.0	59	127.7	94.7	19	175.9	130.5	79	224.0	166.2
40	32.1	23.8	100	80.3	59.6	60	128.5	95.3	20	176.7	131.1	80	224.8	166.8
41	32.9	24.4	101	81.1	60.2	161	129.3	95.9	221	177.5	131.7	281	225.7	167.4
42	33.7	25.0	02	81.9	60.8	62	130.1	96.5	22	178.3	132.3	82	226.5	168.0
43	34.5	25.6	03	82.7	61.4	63	130.9	97.1	23	179.1	132.9	83	227.3	168.6
44	35.3	26.2	04	83.5	62.0	64	131.7	97.7	24	179.9	133.4	84	228.1	169.2
45	36.1	26.8	05	84.3	62.6	65	132.5	98.3	25	180.7	134.0	85	228.9	169.8
46	36.9	27.4	06	85.1	63.1	66	133.3	98.9	26	181.5	134.6	86	229.7	170.4
47	37.7	28.0	07	85.9	63.7	67	134.1	99.5	27	182.3	135.2	87	230.5	171.0
48	38.5	28.6	08	86.7	64.3	68	134.9	100.1	28	183.1	135.8	88	231.3	171.6
49	39.3	29.2	09	87.5	64.9	69	135.7	100.7	29	183.9	136.4	89	232.1	172.2
50	40.2	20.8	10	88.3	65.5	70	136.5	101.3	30	184.7	137.0	90	232.9	172.8
51	41.0	30.4	111	89.1	66.1	171	137.3	101.9	231	185.5	137.6	291	233.7	173.4
52	41.8	31.0	12	89.9	66.7	72	138.1	102.5	32	186.3	138.2	92	234.5	174.0
53	42.6	31.6	13	90.7	67.3	73	138.9	103.1	33	187.1	138.8	93	235.3	174.6
54	43.4	32.2	14	91.5	67.9	74	139.7	103.7	34	187.9	139.4	94	236.1	175.1
55	44.2	32.8	15	92.4	68.5	75	140.5	104.3	35	188.7	140.0	95	236.9	175.7
56	45.0	33.4	16	93.2	69.1	76	141.3	104.9	36	189.5	140.6	96	237.7	176.3
57	45 8	34.0	17	94.0	69.7	77	142.1	105.4	37	190.3	141.2	97	238.5	176.9
58	46.6	34.6	18	94.8	70.3	78	142.9	106.0	38	191.1	141.8	98	239.3	177.5
59	47.4	35.1	19	95.6	70.9	79	143.7	106.6	39	192.1	142.4	99	240.1	178.1
60	48.2	35.7	120	96.4	71.5	180	144.3	107.2	40	192.7	143.0	300	240.0	178.7
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 4 ¾ Points.

TABLE II. Difference of Latitude and Departure for $3\frac{1}{2}$ Points.

Diff	Lat.	Dep.	Diff	Lat.	Dep.	Diff	Lat.	Dep.	Diff	Lat.	Dep.	Diff	Lat.	Dep.
1	00.8	00.6	61	47.1	38.7	121	93.5	76.7	181	139.9	114.8	241	186.2	152.8
2	01.5	01.3	62	47.9	39.3	22	94.3	77.4	82	140.6	115.4	42	187.0	153.5
3	02.3	01.9	63	48.7	40.0	23	95.1	78.0	83	141.4	116.0	43	187.8	154.1
4	03.1	02.5	64	49.5	40.6	24	95.8	78.6	84	142.2	116.6	44	188.6	154.7
5	03.9	03.2	65	50.2	41.2	25	96.6	79.3	85	143.0	117.3	45	189.3	155.4
6	04.6	03.8	66	51.0	41.9	26	97.4	79.9	86	143.7	118.0	46	190.1	156.0
7	05.4	04.4	67	51.8	42.5	27	98.1	80.5	87	144.5	118.6	47	190.9	156.6
8	06.2	05.1	68	52.6	43.1	28	98.9	81.2	88	145.3	119.2	48	191.6	157.3
9	07.0	05.7	69	53.3	43.8	29	99.7	81.8	89	146.1	119.9	49	192.4	157.9
10	07.7	06.3	70	54.1	44.4	30	100.5	82.4	90	146.8	120.5	50	193.2	158.5
11	08.5	07.0	71	54.9	45.0	131	101.2	83.1	191	147.6	121.1	251	194.0	159.2
12	09.3	07.6	72	55.6	45.7	32	102.0	83.7	92	148.4	121.8	52	194.7	159.8
13	10.1	08.2	73	56.4	46.3	33	102.8	84.3	93	149.1	122.4	53	195.5	160.4
14	10.8	08.9	74	57.2	46.9	34	103.6	85.0	94	149.9	123.0	54	196.3	161.1
15	11.6	09.5	75	58.0	47.6	35	104.3	85.6	95	150.7	123.7	55	197.1	161.7
16	12.4	10.1	76	58.7	48.2	36	105.1	86 2	96	151.4	124.3	56	197.8	162.3
17	13.1	10.8	77	59.5	48.8	37	105.9	86.9	97	152.2	124.9	57	198.6	163.0
18	13.9	11.4	78	60.3	49.5	38	106.6	87.5	98	153.0	125.6	58	199.4	163.6
19	14.7	12.0	79	61.1	50.1	39	107.4	88.1	99	153.8	126.2	59	200.1	164.2
20	15.5	12.7	80	61.8	50.7	40	108.2	88.8	200	154.6	126.8	60	200.9	164.9
21	16.2	13.3	81	62.6	51.4	141	109.0	89.4	201	155.3	127.5	261	201.7	165.5
22	17.0	14.0	82	63.4	52.0	42	109.7	90.0	02	156.1	128.1	62	202.5	166.1
23	17.8	14.6	83	64.1	52.6	43	110.5	90.7	03	156.9	128.7	63	203.2	166.8
24	18.5	15.2	84	64.9	53.3	44	111.3	91.3	04	157.6	129.4	64	204.0	167.4
25	19.3	15.9	85	65.7	53.9	45	112.1	92.0	05	158.4	130.0	65	204.8	168.0
26	20.1	16.5	86	66.5	54.5	46	112.8	92.6	06	159.2	130.6	66	205.6	168.7
27	20.9	17.1	87	67.2	55.2	47	113.6	93.2	07	160.0	131.3	67	206.3	169.3
28	21.6	17.8	88	68.0	55.8	48	114.4	93.9	08	160.7	131.9	68	207.1	170.0
29	22.4	18.4	89	68.8	56.4	49	115.1	94.5	09	161.5	132.5	69	207.9	170.6
30	23.2	19.0	90	69.6	57.1	50	115.9	95.1	10	162.3	133.2	70	208.6	171.2
31	24.0	19.7	91	70.3	57.7	151	116.7	95.8	211	163.1	133.8	271	209.4	171.9
32	24.7	20.3	92	71.1	58.3	52	117.5	96.4	12	163.8	134.4	72	210.2	172.5
33	25.5	20.9	93	71.9	59.0	53	118.2	97.0	13	164.6	135.1	73	211.0	173.1
34	26.3	21.6	94	72.6	59.6	54	119.0	97.7	14	165.4	135.7	74	211.7	173.8
35	27.1	22.2	95	73.4	60.2	55	119.8	98.3	15	166.1	136.3	75	212.5	174.4
36	27.8	22.8	96	74.2	60.9	56	120 6	98.9	16	166 9	137.0	76	213.3	175.0
37	28.6	23.5	97	75.0	61.5	57	121.3	99.6	17	167.7	137.6	77	214.1	175.7
38	29.4	24.1	98	75.7	62.1	58	122.1	100.2	18	168.5	138.2	78	214.8	176.3
39	30.1	24.7	99	76.5	62.8	59	122.9	100.8	19	169.2	138.9	79	215.6	176.9
40	30.9	25.4	100	77.2	63.4	60	123.6	101.5	20	170.0	139.5	80	216.4	177.6
41	31.7	26.0	101	78.0	64.0	161	124.4	102.1	221	170,8	140.1	281	217.1	178.2
42	32.5	26.6	02	78.8	64.7	62	125.2	102.7	22	171.6	140.8	82	217.9	178.8
43	33.2	27.3	03	79.6	65.3	63	126.0	103.4	23	172.3	141.4	83	218.7	179.5
44	34.0	27.9	04	80.4	66.0	64	126.7	104.0	24	173.1	142.0	84	219.5	180.1
45	34.8	28.5	05	81.1	66.6	65	127.5	104.6	25	173.9	142.7	85	220.2	180.7
46	35.6	29.2	06	81.9	67.2	66	128.3	105.3	26	174.6	143.3	86	221.0	181.4
47	36.3	29.8	07	82.7	67.9	67	129.1	105.9	27	175.4	144.0	87	221.8	182.0
48	37.1	30.4	08	83.5	68.5	68	129.8	106.5	28	176.2	144.6	88	222.6	182.6
49	37.9	31.1	09	84.2	69.1	69	130.6	107.2	29	177.0	145.2	89	223.3	183.3
50	38.6	31.7	110	85.0	69.8	70	131.4	107.8	30	177.7	145.9	90	224.1	183.9
51	39.4	32.3	111	85.8	70.4	171	132.1	108.4	231	178.5	146.5	291	224.9	184.5
52	40.2	33.0	12	86.6	71.0	72	132.9	109.1	32	179.3	147.2	92	225.6	185.2
53	41.0	33.6	13	87.3	71.7	73	133.7	109.7	33	180.1	147.8	93	226.4	185.8
54	41.7	34.2	14	88.1	72.3	74	134.5	110.3	34	180.8	148.4	94	227.2	186.4
55	42.5	34.9	15	88.9	72.9	75	135.2	111.0	35	181.6	149.0	95	228.0	187.1
56	43.3	35.5	16	89.6	73.6	76	136.0	111.6	36	182.4	149.7	96	228.7	187.7
57	44.1	36.1	17	90.4	74.2	77	136.8	112.2	37	183.1	150.3	97	229.5	188.3
58	44.8	36.8	18	91.2	74.8	78	137.6	112.9	38	183.9	150.9	98	230.3	189.0
59	45.6	37.4	19	92.0	75.5	79	138.3	113.5	39	184.7	151.6	99	231.1	189.6
60	46.4	38.0	120	92.7	76.1	80	139.1	114.1	240	185.5	152.2	300	231.8	190.2
Diff	Dep	Lat.	Diff	Dep	Lat.	Diff	Dep.	Lat.	Diff	Dep.	Lat.	Diff	Dep.	Lat.

for $4\frac{1}{2}$ Points.

TABLE II. Difference of Latitude and Departure for 3 ¾ Points.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	45.2	41.0	121	89.6	81.2	181	134.1	121.5	241	178.5	161.8
2	01.5	01.3	62	45.9	41.6	22	90.4	81.9	82	134.8	122.2	42	179.3	162.5
3	02.2	02.0	63	46.7	42.3	23	91.1	82.6	83	135.6	122.9	43	180.0	163.2
4	03.0	02.7	64	47.4	43.0	24	91.9	83.3	84	136.3	123.5	44	180.7	163.8
5	03.7	03.4	65	48.2	43.6	25	92.6	83.9	85	137.0	124.2	45	181.5	164.5
6	04.4	04.0	66	48.9	44.3	26	93.3	84.6	86	137.8	124.9	46	182.2	165.2
7	05.2	04.7	67	49.6	45.0	27	94.1	85.3	87	138.5	125.6	47	183.0	165.8
8	05.9	05.4	68	50.4	45.7	28	94.8	85.9	88	139.3	126.2	48	183.7	166.5
9	06.7	06.0	69	51.1	46.3	29	95.6	86.6	89	140.0	126.9	49	184.4	167.2
10	07.4	06.7	70	51.9	47.0	30	96.3	87.3	90	140.7	127.6	50	185.2	167.9
11	08.2	07.4	71	52.6	47.7	131	97.0	88.0	191	141.5	128.2	251	185.9	168 5
12	08.9	08.1	72	53.3	48.3	32	97.8	88.6	92	142.2	128.9	52	186.7	169.2
13	09.6	08.7	73	54.1	49.0	33	98.5	89.3	93	143.0	129.6	53	187.4	169.9
14	10.4	09.4	74	54.8	49.7	34	99.3	90.0	94	143.7	130.3	54	188.2	170.5
15	11.1	10.1	75	55.6	50.4	35	100.0	90.6	95	144.4	130.9	55	188.9	171.2
16	11.9	10.7	76	56.3	51.0	36	100.7	91.3	96	145.2	131.6	56	189.6	171.9
17	12.6	11.4	77	57.0	51.7	37	101.5	92.0	97	145.9	132.3	57	190.4	172.6
18	13.3	12.1	78	57.8	52.4	38	102.2	92.7	98	146.7	132.9	58	191.1	173.2
19	14.1	12.8	79	58.5	53.0	39	103.0	93.3	99	147.4	133.6	59	191.8	173.9
20	14.8	13.4	80	59.3	53.7	40	103.7	94.0	200	148.2	134.3	60	192.6	174.6
21	15.6	14.1	81	60.0	54.4	141	104.4	94.7	201	148.9	135.0	261	193.3	175.2
22	16.3	14.8	82	60.7	55.1	42	105.2	95.3	02	149.6	135.6	62	194.1	175.9
23	17.0	15.4	83	61.5	55.8	43	105.9	96.0	03	150.4	136.7	63	194.8	176.6
24	17.8	16.1	84	62.2	56.4	44	106.7	96.7	04	151.1	137.0	64	195.6	177.3
25	18.5	16.8	85	63.0	57.1	45	107.4	97.4	05	151.9	137.6	65	196.3	177.9
26	19.3	17.5	86	63.7	57.7	46	108.2	98.0	06	152.6	138 3	66	197.0	178.6
27	20.0	18.1	87	64.4	58.4	47	108.9	98.7	07	153.3	139.0	67	197.8	179.3
28	20.7	18.8	88	65.2	59.1	48	109.6	99.4	08	154.1	139.7	68	198.5	179.9
29	21.5	19.5	89	65.9	59.8	49	110.4	100.0	09	154.8	140.3	69	199.3	180.6
30	22.2	20.1	90	66.7	60.4	50	111.1	100.7	10	155.6	141.0	70	200.0	181.3
31	23.0	20.8	91	67.4	61.1	151	111.9	101.4	211	156.3	141.7	271	200.7	182.0
32	23.7	21.5	92	68.2	61.8	52	112.6	102.1	12	157.0	142.3	72	201.5	182.6
33	24.4	22.2	93	68.9	62.4	53	113.3	102.7	13	157.8	143.0	73	202.2	183.3
34	25.2	22.8	94	69.6	63.1	54	114.1	103.4	14	158.5	143.7	74	203.0	184.0
35	25.9	23.5	95	70.4	63.8	55	114.8	104.1	15	159.3	144.4	75	203.7	184.6
36	26.7	24.2	96	71.1	64.5	56	115.6	104.7	16	160.0	145.0	76	204.4	185.3
37	27.4	24.8	97	71.9	65.1	57	116.3	105.4	17	160.7	145.7	77	205.2	186.0
38	28.2	25.5	98	72.6	65.8	58	117.0	106.1	18	161.5	146.4	78	205.9	186.7
39	28.9	26.2	99	73.3	66.5	59	117.8	106.8	19	162.2	147.0	79	206.7	187.3
40	29.6	26.9	100	74.1	67.1	60	118.5	107.4	20	163.0	147.7	80	207.4	188.0
41	30.4	27.5	101	74.8	67.8	161	119.3	108.1	221	163.7	148.4	281	208.2	188.7
42	31.1	28.2	02	75.6	68.5	62	120.0	108.8	22	164.4	149.1	82	208.9	189.3
43	31.9	28.9	03	76.3	69.2	63	120.7	109.4	23	165.2	149.7	83	209.6	190.0
44	32.6	29.5	04	77.0	69.8	64	121.5	110.1	24	165.9	150.4	84	210.4	190.7
45	33.3	30.2	05	77.8	70.5	65	122.2	110.8	25	166.7	151.1	85	211.1	191.4
46	34.1	30.9	06	78.5	71.2	66	123.0	111.5	26	167.4	151.7	86	211.9	192.0
47	34.8	31.6	07	79.3	71.8	67	123.7	112.1	27	168.2	152.4	87	212.6	192.7
48	35.6	32.2	08	80.0	72.5	68	124.4	112.8	28	168.9	153.1	88	213.3	193.4
49	36.3	32.9	09	80.7	73.2	69	125.2	113.5	29	169.6	153.8	89	214.1	194.0
50	37.0	33.6	10	81.5	73.9	70	125.9	114.1	30	170.4	154 5	90	214.8	194.7
51	37.8	34.2	111	82.2	74.5	171	126.7	114.8	231	171.1	155.1	291	215.6	195.4
52	38.5	34.9	12	83.0	75.2	72	127.4	115.5	32	171.9	155.8	92	216.3	196.1
53	39.3	35.6	13	83.7	75.9	73	128.2	116.2	33	172 6	156.4	93	217.0	196.7
54	40.0	36.3	14	84.4	76.5	74	128.9	116.8	34	173.3	157.1	94	217.8	197.4
55	40.7	36.9	15	85.2	77.2	75	129.6	117.5	35	174.1	157.8	95	218.5	198.1
56	41.5	37.6	16	85.9	77.9	76	130.4	118.2	36	174.8	158.5	96	219.3	198.7
57	42.2	38.3	17	86.7	78.6	77	131.1	118.8	37	175.6	159.1	97	220.0	199.9
58	43.0	38.9	18	87.5	79.2	78	131.9	119.5	38	176.3	159.8	98	220.7	200.1
59	43.7	39.6	19	88.2	79.9	79	132.6	120.2	39	177.0	160.5	99	221.5	200.8
60	44.5	40.3	120	88.9	80.6	180	133.3	120.9	140	177.8	161.1	300	222.2	201.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 4 ¼ Points.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	01.4	01.4	62	43.8	43.8	22	86.3	86.3	82	128.7	128.7	42	171.1	171.1
3	02.1	02.1	63	44.5	44.5	23	87.0	87.0	83	129.4	129.4	43	171.8	171.8
4	02.8	02.8	64	45.3	45.3	24	87.7	87.7	84	130.1	130.1	44	172.5	172.5
5	03.5	03.5	65	46.0	46.0	25	88.4	88.4	85	130.8	130.8	45	173.2	173.2
6	04.2	04.2	66	46.7	46.7	26	89.1	89.1	86	131.5	131.5	46	173.9	173.9
7	04.9	04.9	67	47.4	47.4	27	89.8	89.8	87	132.2	132.2	47	174.6	174.6
8	05.7	05.7	68	48.1	48.1	28	90.5	90.5	88	132.9	132.9	48	175.4	175.4
9	06.4	06.4	69	48.8	48.8	29	91.2	91.2	89	133.6	133.6	49	176.1	176.1
10	07.1	07.1	70	49.5	49.5	30	91.9	91.9	90	134.3	134.3	50	176.8	176.8
11	07.8	07.8	71	50.2	50.2	131	92.6	92.6	91	135.1	135.1	251	177.5	177.5
12	08.5	08.5	72	50.9	50.9	32	93.3	93.3	92	135.8	135.8	52	178.2	178.2
13	09.2	09.2	73	51.6	51.6	33	94.0	94.0	93	136.5	136.5	53	178.9	178.9
14	09.9	09.9	74	52.3	52.3	34	94.7	94.7	94	137.2	137.2	54	179.6	179.6
15	10.6	10.6	75	53.0	53.0	35	95.5	95.5	95	137.9	137.9	55	180.3	180.3
16	11.3	11.3	76	53.7	53.7	36	96.2	96.2	96	138.6	138.6	56	181.0	181.0
17	12.0	12.0	77	54.4	54.4	37	96.9	96.9	97	139.3	139.3	57	181.7	181.7
18	12.7	12.7	78	55.2	55.2	38	97.6	97.6	98	140.0	140.0	58	182.4	182.4
19	13.4	13.4	79	55.9	55.9	39	98.3	98.3	99	140.7	140.7	59	183.1	183.1
20	14.1	14.1	80	56.6	56.6	40	99.0	99.0	200	141.4	141.4	60	183.8	183 8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.5	184.5
22	15.6	15.6	82	58.0	58.0	42	100.4	100.4	02	142.8	142.8	62	185.3	185.3
23	16.3	16.3	83	58.7	58.7	43	101.1	101.1	03	143.5	143.5	63	186.0	186.0
24	17.0	17,0	84	59.4	59.4	44	101.8	101.8	04	144.2	144.2	64	186.7	186.7
25	17.7	17.7	85	60.1	60.1	45	102.5	102.5	05	144.9	144.9	65	187.4	187.4
26	18.4	18.4	86	60.8	60.8	46	103.2	103.2	06	145.7	145.7	66	188.1	188.1
27	19.1	19.1	87	61.5	61.5	47	103.9	103.9	07	146.4	146.4	67	188.8	188.8
28	19.8	19.8	88	62.2	62.2	48	104.6	104.6	08	147.1	147.1	68	189.5	189.5
29	20.5	20.5	89	62.9	62.9	49	105.4	105.4	09	147.8	147.8	69	190.2	190.2
30	21.2	21.2	90	63.6	63.6	50	106.1	106.1	10	148.5	148.5	70	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191,6
32	22.6	22.6	92	65.1	65.1	52	107.5	107.5	12	149.9	149.9	72	192.3	192.3
33	23.3	23.3	93	65.8	65.8	53	108.2	108.2	13	150.6	150.6	73	193.0	193.0
34	24.0	24.0	94	66.5	66.5	54	108.9	108.9	14	151.3	151.3	74	193.7	193.7
35	24.7	24.7	95	67.2	67.2	55	109.6	109 6	15	152.0	152.0	75	194.4	194.4
36	25.5	25.5	96	67.9	67.9	56	110.3	110.3	16	152.7	152.7	76	195.2	195.2
37	26.2	26.2	97	68.6	68.6	57	111.0	111.0	17	153.4	153.4	77	195.9	195 9
38	26.9	26.9	98	69.3	69.3	58	111.7	111.7	18	154.1	154.1	78	196.6	196.6
39	27.6	27.6	99	70.0	70.0	59	112.4	112.4	19	154.8	154.8	79	197.3	197.3
40	28.3	28.3	100	70.7	70.7	60	113.1	113.1	20	155.6	155.6	80	198.0	198.0
41	29 0	29.0	101	71.4	71.4	161	113.8	113.8	221	156 3	156.3	281	198.7	198.7
42	29.7	29.7	02	72.1	72.1	62	114.5	114.5	22	157.0	157.0	82	199.4	199.4
43	30.4	30.4	03	72.8	72.8	63	115.3	115.3	23	157.7	157.7	83	200.1	200.1
44	31.1	31.1	04	73.5	73.5	64	116.0	116.0	24	158.4	158.4	84	200.8	200.8
45	31.8	31 8	05	74.2	74 2	65	116.7	116.7	25	159.1	159.1	85	201.5	201.5
46	32.5	32.5	06	74.9	74.9	66	117.4	117.4	26	159.8	159.8	86	202.2	202.2
47	33.2	33.2	07	75.7	75.7	67	118.1	118.1	27	160.5	160.5	87	202.9	202.9
48	33.9	33.9	08	76.4	76.4	68	118.8	118.8	28	161.2	161.2	88	203.6	203.6
49	34.6	34.6	09	77.1	77.1	69	119.5	119.5	29	161.9	161.9	89	204.3	204.3
50	35.4	35.4	10	77.8	77.8	70	120.2	120.2	30	162.6	162.6	90	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	12	79.2	79.2	72	121 6	121.6	32	164.0	164.0	92	206.5	206.5
53	37.5	37.5	13	79.9	79.9	73	122.3	122.3	33	164.7	164.7	93	207.2	207.2
54	38.2	38.2	14	80.6	80.6	74	123.0	123.0	34	165.5	165.5	94	207.9	207.9
55	38.9	38.9	15	81.3	81.3	75	123.7	123.7	35	166.2	166.2	95	208.6	208.6
56	39.6	39.6	16	82.0	82.0	76	124.4	124.4	36	166.9	166.9	96	209.3	209.3
57	40.3	40.3	17	82.7	82.7	77	125.2	125.2	37	167.6	167.6	97	210.0	210 0
58	41.0	41.0	18	83.4	83.4	78	125.9	125.9	38	168.3	168.3	98	210.7	210.7
59	41.7	41.7	19	84.1	84.1	79	126.6	126.6	39	169.0	169.0	99	211.4	211 4
60	42.4	42.4	120	84.8	84.8	180	127 3	127.3	40	169.7	169.7	300	21.21	212.1
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.0	61	61.0	01.1	121	121.0	02.1	181	181.0	03.1	241	241.0	04.1
2	02.0	00.0	62	62.0	01.1	22	122.0	02.1	82	182.0	03.1	42	242.0	04.2
3	03.0	00.1	63	63.0	01.1	23	123.0	02.1	83	183.0	03.2	43	243.0	04.2
4	04.0	00.1	64	64.0	01.1	24	124.0	02.2	84	184.0	03.2	44	244.0	04.2
5	05.0	00.1	65	65.0	01.1	25	125.0	02.2	85	185.0	03.2	45	245.0	04.2
6	06.0	00.1	66	66.0	01.2	26	126.0	02.2	86	186.0	03.2	46	246.0	04.2
7	07.0	00.1	67	67.0	01.2	27	127.0	02.2	87	187 0	03.2	47	247.0	04.2
8	08.0	00.1	68	68.0	01.2	28	128.0	02.2	88	188.0	03.2	48	248.0	04.3
9	09.0	00.2	69	69.0	01.2	29	129.0	02.2	89	189.0	03.3	49	249.0	04.3
10	10.0	00.2	70	70.0	01.2	30	130.0	02.3	90	190.0	03.3	50	250.0	04.3
11	11.0	00.2	71	71.0	01.2	131	131.0	02.3	191	191.0	03.3	251	251.0	04.3
12	12.0	00.2	72	72.0	01.3	32	132.0	02.3	92	192.0	03.3	52	252.0	04.3
13	13.0	00.2	73	73.0	01.3	33	133.0	02.3	93	193.0	03.3	53	253.0	04.3
14	14.0	00.2	74	74.0	01.3	34	134.0	02.3	94	194.0	03.3	54	254.0	04.4
15	15.0	00.3	75	75.0	01.3	35	135.0	02.3	95	195.0	03.4	55	255.0	04.4
16	16.0	00.3	76	76.0	01.3	36	136.0	02.4	96	196.0	03.4	56	256.0	04.4
17	17.0	00.3	77	77.0	01.3	37	137.0	02.4	97	197.0	03.4	57	257.0	04.4
18	18.0	00.3	78	78.0	01.4	38	138.0	02.4	98	198.0	03.4	58	258.0	04.4
19	19.0	00.3	79	79.0	01.4	39	139.0	02.4	99	199.0	03.4	59	259.0	04.4
20	20.0	00.4	80	80.0	01.4	40	140.0	02.4	200	200.0	03.4	60	260.0	04.5
21	21.0	00.4	81	81.0	01.4	141	141.0	02.4	201	201.0	03.5	261	261.0	04.5
22	22.0	00.4	82	82.0	01.4	42	142.0	02.5	02	202.0	03.5	62	262.0	04.5
23	23.0	00.4	83	83.0	01.5	43	143.0	02.5	03	203.0	03.5	63	263.0	04.5
24	24.0	00.4	84	84.0	01.5	44	144.0	02.5	04	204.0	03.5	64	264.0	04.5
25	25.0	00.4	85	85.0	01.5	45	145.0	02.5	05	205.0	03.5	65	265.0	04.6
26	26.0	00.5	86	86.0	01.5	46	146.0	02.5	06	206.0	03.5	66	266.0	04.6
27	27.0	00.5	87	87.0	01.5	47	147.0	02.5	07	207.0	03.6	67	267.0	04.6
28	28.0	00.5	88	88.0	01.5	48	148.0	02.6	08	208.0	03.6	68	268.0	04.6
29	29.0	00.5	89	89.0	01.6	49	149.0	02.6	09	209.0	03.6	69	269.0	04.6
30	30.0	00.5	90	90.0	01.6	50	150.0	02.6	10	210.0	03.6	70	270.0	04.6
31	31.0	00.5	91	91.0	01.6	151	151.0	02.6	211	211.0	03.6	271	271 0	04.7
32	32.0	00.6	92	92.0	01.6	52	152.0	02.6	12	212.0	03.6	72	272.0	04.7
33	33.0	00.6	93	93.0	01.6	53	153.0	02.6	13	213.0	03.7	73	273.0	04.7
34	34.0	00.6	94	94.0	01.6	54	154.0	02.7	14	214.0	03.7	74	274.0	04.7
35	35.0	00.6	95	95.0	01.7	55	155.0	02.7	15	215.0	03.7	75	275.0	04.7
36	36.0	00.6	96	96.0	01.7	56	156.0	02.7	16	216.0	03.7	76	276.0	04.7
37	37.0	00.6	97	97.0	01.7	57	157.0	02.7	17	217.0	03.7	77	277.0	04.8
38	38.0	00.7	98	98.0	01.7	58	158.0	02.7	18	218.0	03.8	78	278.0	04.8
39	39.0	00.7	99	99.0	01.7	59	159.0	02.7	19	219.0	03.8	79	179.0	04.8
40	40.0	00.7	100	100.0	01.7	60	160.0	02.8	20	220.0	03.8	80	280.0	04.8
41	41.0	00.7	101	101.0	01.8	161	161.0	02.8	221	221 0	03.8	281	281.0	04.8
42	42.0	00.7	02	102.0	01.8	62	162.0	02.8	22	222.0	03.8	82	282.0	04.8
43	43.0	00.8	03	103.0	01.8	63	163.0	02 8	23	223.0	03.8	83	283 0	04.9
44	44.0	00.8	04	104.0	01.8	64	164.0	02 8	24	224.0	03.9	84	284.0	04.9
45	45.0	00.8	05	105.0	01.8	65	165.0	02.9	25	225.0	03.9	85	285.0	04.0
46	46.0	00.8	06	106.0	01.8	66	166.0	02.9	26	226.0	03.9	86	286.0	04.0
47	47.0	00.8	07	107.0	01.9	67	167.0	02.9	27	227.0	03.9	87	287.0	04.9
48	48.0	00.8	08	108.0	01.9	68	168.0	02.9	28	228.0	03.9	88	288.0	04.9
49	49.0	00.9	09	109.0	01.9	69	169.0	02.9	29	229.0	03.9	89	289.0	05.0
50	50.0	00.9	10	110.0	01.9	70	170.0	02.9	30	230.0	04.0	90	290.0	05.0
51	51.0	00.9	111	111.0	01.9	171	171.0	03.0	231	231.0	04.0	291	291.0	05.0
52	52.0	00.9	12	112.0	01.9	72	172.0	03.0	32	232.0	04.0	92	292.0	05.0
53	53.0	00.9	13	113.0	02.0	73	173.0	03.0	33	233.0	04.0	93	293.0	05.0
54	54.0	00.9	14	114.0	02.0	74	174.0	03.0	34	234.0	04.0	94	294.0	05.0
55	55.0	01.0	15	115.0	02.0	75	175.0	03.0	35	235 0	04.0	95	295.0	05.1
56	56.0	01.0	16	116.0	02.0	76	176 0	03.0	36	236.0	04.1	96	296.0	05.1
57	57.0	01.0	17	117.0	02.0	77	177.0	03.1	37	237.0	04.1	97	297.0	05.1
58	58.0	01.0	18	118.0	02.1	78	178.0	03.1	38	238.0	04.1	98	298.0	05.1
59	59.0	01.0	19	119.0	02.1	79	179.0	03.1	39	239.0	04.1	99	299.0	05.1
60	60.0	01.1	120	120.0	02.1	180	180.0	03.1	240	240.0	04.1	300	300.0	05.1
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.0	61	61.0	02.1	121	120.9	04.2	181	180.9	06.3	241	240.9	08.4
2	02.0	00.1	62	62.0	02.2	22	121.9	04.3	82	181.9	06.4	42	241.9	08.5
3	03.0	00.1	63	63.0	02.2	23	122.9	04.3	83	182.9	06.4	43	242.9	08.5
4	04.0	00.1	64	64.0	02.2	24	123.9	04.3	84	183.9	06.4	44	243.9	08.5
5	05.0	00.2	65	65.0	02.3	25	124.9	04.4	85	184.9	06.5	45	244.9	08.6
6	06.0	00.2	66	66.0	02.3	26	125.9	04.4	86	185.9	06.5	46	245.9	08.6
7	07.0	00.2	67	67.0	02.3	27	126.9	04.4	87	186.9	06.5	47	246.9	08.6
8	08.0	00.3	68	68.0	02.4	28	127.9	04.5	88	187.9	06.6	48	247.9	08.7
9	09.0	00.3	69	69.0	02.4	29	128.9	04.5	89	188.9	06.6	49	248.9	08.7
10	10.0	00.3	70	70.0	02.4	30	129.9	04.6	90	189.9	06.7	50	249.9	08.8
11	11.0	00.4	71	71.0	02.5	131	130.9	04.6	191	190.9	06.7	251	250.8	08.8
12	12.0	00.4	72	72.0	02.5	32	131.9	04.6	92	191.9	06.7	52	251.8	08.8
13	13.0	00.5	73	73.0	02.5	33	132.9	04.7	93	192.9	06.8	53	252.8	08.9
14	14.0	00.5	74	74.0	02.6	34	133.9	04.7	94	193.9	06.8	54	253.8	08.9
15	15.0	00.5	75	75.0	02.6	35	134.9	04.7	95	194.9	06.8	55	254.8	08.9
16	16.0	00.6	76	76.0	02.7	36	135.9	04.8	96	195.9	06.9	56	255.8	09.0
17	17.0	00.6	77	77.0	02.7	37	136.9	04.8	97	196.9	06.9	57	256.8	09.0
18	18.0	00.6	78	78.0	02.7	38	137.9	04.8	98	197.9	06.9	58	257.8	09.0
19	19.0	00.7	79	79.0	02.8	39	138.9	04.9	99	198.9	07.0	59	258.8	09.1
20	20.0	00.7	80	80.0	02.8	40	139.9	04.9	200	199.9	07.0	60	259.8	09.1
21	21.0	00.7	81	81.0	02.8	141	140.9	04.9	201	200.9	07.0	261	260.8	09.1
22	22.0	00.8	82	81.9	02.9	42	141.9	05.0	02	201.9	07.1	62	261.8	09.2
23	23.0	00.8	83	82.9	02.9	43	142.9	05.0	03	202.9	07.1	63	262.8	09.2
24	24.0	00.8	84	83.9	02.9	44	143.9	05.0	04	203.9	07.1	64	263.8	09.2
25	25.0	00.9	85	83.9	03.0	45	144.9	05.1	05	204.9	07.2	65	264.8	09.3
26	26.0	00.9	86	85.9	03.0	46	145.9	05.1	06	205.9	07.2	66	265.8	09.3
27	27.0	00.9	87	86.9	03.0	47	146.9	05.1	07	206.9	07.2	67	266.8	09.3
28	28.0	01.0	88	87.9	03.1	48	147.9	05.2	08	207.9	07.3	68	267.8	09.4
29	29.0	01.0	89	88.9	03.1	49	148.9	05.2	09	208.9	07.3	69	268.8	09.4
30	30.0	01.1	90	89.9	03.1	50	149.9	05.3	10	209.9	07.4	70	269.8	09.5
31	31.0	01.1	91	90.9	03.2	151	150.9	05.3	211	210.9	07.4	271	270.8	09.5
32	32.0	01.1	92	91.9	03.2	52	151.9	05.3	12	211.9	07.4	72	271.8	09.5
33	33.0	01.2	93	92.9	03.2	53	152.9	05.4	13	212.9	07.5	73	272.8	09.6
34	34.0	01.2	94	93.9	03.3	54	153.9	05.4	14	213.9	07.5	74	273.8	09.6
35	35.0	01.2	95	94.9	03.3	55	154.9	05.4	15	214.9	07.5	75	274.8	09.6
36	36.0	01.3	96	95.9	03.4	56	155.9	05.5	16	215.9	07.6	76	275.8	09.7
37	37.0	01.3	97	96.9	03.4	57	156.9	05.5	17	216.9	07.6	77	276.8	09.7
38	38.0	01.3	98	97.9	03.4	58	157.9	05.5	18	217.9	07.6	78	277.8	09.7
39	39.0	01.4	99	98.9	03.5	59	158.9	05.6	19	218.9	07.7	79	278.8	09.8
40	40.0	01.4	100	99.9	03.5	60	159.9	05.6	20	219.9	07.7	80	279.8	09.8
41	41.0	01.4	101	100.9	03.5	161	160.9	05.6	221	220.9	07.7	281	280.8	09.8
42	42.0	01.5	02	101.9	03.6	62	161.9	05.7	22	221.9	07.8	82	281.8	09.9
43	43.0	01.5	03	102.9	03.6	63	162.9	05.7	23	222.9	07.8	83	282.8	09.9
44	44.0	01.5	04	103.9	03.6	64	163.9	05.7	24	223.9	07.8	84	283.8	09.9
45	45.0	01.6	05	104.9	03.7	65	164.9	05.8	25	224.9	07.9	85	284.8	10.0
46	46.0	01.6	06	105.9	03.7	66	165.9	05.8	26	225.9	07.9	86	285.8	10.0
47	47.0	01.6	07	106.9	03.7	67	166.9	05.8	27	226.9	07.9	87	286.8	10.0
48	48.0	01.7	08	107.9	03.8	68	167.9	05.9	28	227.9	08.0	88	287.8	10.1
49	49.0	01.7	09	108.9	03.8	69	168.9	05.9	29	228.9	08.0	89	288.8	10.1
50	50.0	01.7	10	109.9	03.8	70	169.9	06.0	30	229.9	08.1	90	289.8	10.2
51	51.0	01.8	111	110.9	03.9	171	170.9	06.0	231	230.9	08.1	291	290.8	10.2
52	52.0	01.8	12	111.9	03.9	72	171.9	06.0	32	231.9	08.1	92	291.8	10.2
53	53.0	01.8	13	112.9	04.0	73	172.9	06.1	33	232.9	08.2	93	292.8	10.3
54	54.0	01.9	14	113.9	04.0	74	173.9	06.1	34	233.9	08.2	94	293.8	10.3
55	55.0	01.9	15	114.9	04.0	75	174.9	06.1	35	234.9	08.2	95	294.8	10.3
56	56.0	02.0	16	115.9	04.1	76	175.9	06.2	36	235.9	08.3	96	295.8	10.4
57	57.0	02.0	17	116.9	04.1	77	176.9	06.2	37	236.9	08.3	97	296.8	10.4
58	58.0	02.0	18	117.9	04.1	78	177.9	06.2	38	237.9	08.3	98	297.8	10.4
59	59.0	02.1	19	118.9	04.2	79	178.9	06.3	39	238.9	08.4	99	298.8	10.5
60	60.0	02.1	120	119.9	04.2	180	179.9	06.3	40	239.9	08.4	300	299.8	10.5
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 3 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.9	03.2	121	120.8	06.3	181	180.7	09.5	241	240.7	12.6
2	02.0	00.1	62	61.9	03.2	22	121.8	06.4	82	181.7	09.5	42	241.7	12.7
3	23.0	00.2	63	62.9	03.3	23	122.8	06.4	83	182.7	09.6	43	242.7	12.7
4	04.0	00.2	64	63.9	03.3	24	123.8	06.5	84	183.7	09.6	44	243.7	12.8
5	05.0	00.3	65	64.9	03.4	25	124.8	06.5	85	184.7	09.7	45	244.7	12.8
6	06.0	00.3	66	65.9	03.5	26	125.8	06.6	86	185.7	09.7	46	245.7	12.9
7	07.0	00.4	67	66.9	03.5	27	126.8	06.6	87	186.7	09.8	47	246.7	12.9
8	08.0	00.4	68	67.9	03.6	28	127.8	06.7	88	187.7	09.8	48	247.7	13.0
9	09.0	00.5	69	68.9	03.6	29	128.8	06.8	89	188.7	09.9	49	248.7	13.0
10	10.1	00.5	70	69.9	03.7	30	129.8	06.8	90	189.7	09.9	50	249.7	13.1
11	11.0	00.6	71	70.9	03.7	131	130.8	06.9	191	190.7	10.0	251	250.6	13.1
12	12.0	00.6	72	71.9	03.8	32	131.8	06.9	92	191.7	10.0	52	251.6	13.2
13	13.0	00.7	73	72.9	03.8	33	132.8	07.0	93	192.7	10.1	53	252.6	13.2
14	14.0	00.7	74	73.9	03.9	34	133.8	07.0	94	193.7	10.1	54	253.6	13.3
15	15.0	00.8	75	74.9	03.9	35	134.8	07.1	95	194.7	10.2	55	254.6	13.3
16	16.0	00.8	76	75.9	04.0	36	135.8	07.1	96	195.7	10.3	56	255.6	13.4
17	17.0	00.9	77	76.9	04.0	37	136.8	07.2	97	196.7	10.3	57	256.6	13.4
18	18.0	00.9	78	77.9	04.1	38	137.8	07.2	98	197.7	10.4	58	257.6	13.5
19	19.0	01.0	79	78.9	04.1	39	138.8	07.3	99	198.7	10.4	59	258.6	13.6
20	20.0	01.0	80	79.9	04.2	40	139.8	07.3	200	199.7	10.5	60	259.6	13.6
21	21.0	01.1	81	80.9	04.2	141	140.8	07.4	201	200.7	10.5	261	260.6	13.7
22	22.0	01.1	82	81.9	04.3	42	141.8	07.4	02	201.7	10.6	62	261.6	13.7
23	23.0	01.2	83	82.9	04.3	43	142.8	07.5	03	202.7	10.6	63	262.6	13.8
24	24.0	01.3	84	83.9	04.4	44	143.8	07.5	04	203.7	10.7	64	263.6	13.8
25	25.0	01.3	85	84.9	04.4	45	144.8	07.6	05	204.7	10.7	65	264.6	13.9
26	26.0	01.4	86	85.9	04.5	46	145.8	07.6	06	205.7	10.8	66	265.6	13.9
27	27.0	01.4	87	86.9	04.6	47	146.8	07.7	07	206.7	10.8	67	266.6	14.0
28	28.	01.5	88	87.9	04.6	48	147.8	07.7	08	207.7	10.9	68	267.6	14.0
29	29.0	01.5	89	88.9	04.7	49	148.8	07.8	09	208.7	10.9	69	268.6	14.1
30	30.0	01.6	90	89.9	04.7	50	149.8	07.9	10	209.7	11.0	70	269.6	14.1
31	31.0	01.6	91	90.9	04.8	151	150.8	07.9	211	210.7	11.0	271	270.6	14.2
32	32.0	01.7	92	91.9	04.8	52	151.8	08.0	12	211.7	11.1	72	271.6	14.2
33	33.0	01.7	93	92.9	04.9	53	152.8	08.0	13	212.7	11.1	73	272.6	14.3
34	34.0	01.8	94	93.9	04.9	54	153.8	08.1	14	213.7	11.2	74	273.6	14.3
35	35.0	01.8	95	94.9	05.0	55	154.8	08.1	15	214.7	11.2	75	274.6	14.4
36	35.9	01.9	96	95.9	05.0	56	155.8	08.2	16	215.7	11.3	76	275.6	14.4
37	36.9	01.9	97	96.9	05.1	57	156.8	08.2	17	216.7	11.4	77	276.6	14.5
38	37.9	02.0	98	97.9	05.1	58	157.8	08.3	18	217.7	11.4	78	277.6	14.5
39	38.9	02.0	99	98.9	05.2	59	158.8	08.3	19	218.7	11.5	79	278.6	14.6
40	39.9	02.1	100	99.9	05.2	60	159.8	08.4	20	219.7	11.5	80	279.6	14.7
41	40.9	02.1	101	100.9	05.3	161	160.8	08.4	221	220.7	11.6	281	280.6	14.7
42	41.9	02.2	02	101.9	05.3	62	161.8	08.5	22	221.7	11.6	82	281.6	14.8
43	42.9	02.2	03	102.9	05.4	63	162.8	08.5	23	222.7	11.7	83	282.6	14.8
44	43.9	02.3	04	103.9	05.4	64	163.8	08.6	24	223.7	11.7	84	283.6	14.9
45	44.9	02.4	05	104.9	05.5	65	164.8	08.6	25	224.7	11.8	85	284.6	14.9
46	45.9	02.4	06	105.9	05.5	66	165.8	08.7	26	225.7	11.8	86	285.6	15.0
47	46.9	02.5	07	106.9	05.6	67	166.8	08.7	27	226.7	11.9	87	286.6	15.0
48	47.9	02.5	08	107.8	05.7	68	167.8	08.8	28	227.7	11.9	88	287.6	15.1
49	48.9	02.6	09	108.8	05.7	69	168.8	08.8	29	228.7	12.0	89	288.6	15.1
50	49.9	02.6	10	109.8	05.8	70	169.8	08.9	30	229.7	12.0	90	289.6	15.2
51	50.9	02.7	111	110.8	05.8	171	170.8	09.0	231	230.7	12.1	291	290.6	15.2
52	51.9	02.7	12	111.8	05.9	72	171.8	09.0	32	231.7	12.1	92	291.6	15.3
53	52.9	02.8	13	112.8	05.9	73	172.8	09.1	33	232.7	12.2	93	292.6	15.3
54	53.9	02.8	14	113.8	06.0	74	173.8	09.1	34	233.7	12.2	94	293.6	15.4
55	54.9	02.9	15	114.8	06.0	75	174.8	09.2	35	234.7	12.3	95	294.6	15.4
56	55.9	02.9	16	115.8	06.1	76	175.8	09.2	36	235.7	12.3	96	295.6	15.5
57	56.9	03.0	17	116.8	06.1	77	176.8	09.3	37	236.7	12.4	97	296.6	15.5
58	57.9	03.0	18	117.8	06.2	78	177.8	09.3	38	237.7	12.5	98	297.6	15.6
59	58.9	03.1	19	118.8	06.2	79	178.8	09.4	39	238.7	12.5	99	298.6	15.6
60	59.9	03.1	120	119.8	06.3	180	179.8	09.4	240	239.7	12.6	300	299.6	15.7
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.9	04.3	121	120.7	08.4	181	180.6	12.6	241	240.4	16.8
2	02.0	00.1	62	61.9	04.3	22	121.7	08.5	82	181.6	12.7	42	241.4	16.9
3	03.0	00.2	63	62.8	04.4	23	122.7	08.6	83	182.6	12.8	43	242.4	16.9
4	04.0	00.3	64	63.8	04.5	24	123.7	08.6	84	183.6	12.8	44	243.4	17.0
5	05.0	00.3	65	64.8	04.5	25	124.7	08 7	85	184.6	12.9	45	244.4	17.1
6	06.0	00.4	66	65.8	04.6	26	125.7	08.8	86	185.6	13.0	46	245.4	17.1
7	07.0	00.5	67	66.8	04.7	27	126.7	08.9	87	186.6	13.0	47	246.4	17.2
8	08.0	00.6	68	67.8	04.7	28	127.7	08.9	88	187.5	13.1	48	247.4	17.3
9	09.0	00.6	69	68.8	04.8	29	128.7	09.0	89	188.5	13.2	49	248.4	17.4
10	10.0	00.7	70	69.8	04.9	30	129.7	09.1	90	189.5	13.2	50	249.4	17.4
11	11.0	00.8	71	70.8	05.0	131	130.7	09.1	191	190.5	13.3	251	250.4	17.5
12	12.0	00.8	72	71.8	05.0	32	131.7	09.2	92	191.5	13.4	52	251.4	17.6
13	13.0	00.9	73	72.8	05.1	33	132.7	09.3	93	192.5	13.5	53	252.4	17.6
14	14.0	01.0	74	73.8	05.2	34	133.7	09.3	94	193.5	13.5	54	253.4	17.7
15	15.0	01.0	75	74.8	05.2	35	134.7	09.4	95	194.5	13.6	55	254 4	17.8
16	16.0	01.1	76	75.8	05.3	36	135.7	09.5	96	195.5	13.7	56	255.4	17.8
17	17.0	01.2	77	76.8	05.4	37	136.7	09.5	97	196.5	13.7	57	256.4	17.9
18	18.0	01.3	78	77.8	05.4	38	137.7	09.6	98	197.5	13.8	58	257.4	18.0
19	19.0	01.3	79	78.8	05.5	39	138.7	09.7	99	198.5	13.9	59	258.4	18.1
20	20.0	01.4	80	79.8	05 6	40	139.7	09.8	200	199.5	13.9	60	259.4	18.1
21	20.9	01.5	81	80.8	05.7	141	140.7	09.8	201	200.5	14.0	261	260.4	18.2
22	21.9	01.5	82	81.8	05.7	42	141.7	09.9	02	201.5	14.1	62	261.4	18.3
23	22.9	01.6	83	82.8	05.8	43	142.7	10.0	03	202.5	14.1	63	262.4	18.3
24	23.9	01.7	84	83.8	05.9	44	143.7	10.0	04	203.5	14.2	64	263.4	18.4
25	24.9	01.7	85	84.8	05.9	45	144.7	10.1	05	204.5	14.3	65	264.4	18.5
26	25.9	01.8	86	85.8	06.0	46	145.6	10.2	06	205.5	14.4	66	265.4	18.5
27	26.9	01.9	87	86.8	06.1	47	146.6	10.2	07	206.5	14.4	67	266.4	18.6
28	27.9	02.0	88	87.8	06.1	48	147.6	10.3	08	207.5	14.5	68	267.4	18.7
29	28.9	02.0	89	88.8	06.2	49	148.6	10.4	09	208.5	14.6	69	268.4	18.7
30	29.9	02.1	90	89.8	06.3	50	149.6	10.5	10	209.5	14 6	70	269.4	18.8
31	30.9	02.2	91	90.8	06.4	151	150.6	10.5	211	210.5	14.7	271	270.3	18.9
32	31.9	02.2	92	91.8	06.4	52	151.6	10.6	12	211.5	14.8	72	271.3	19.0
33	32.9	02.3	93	92.8	06.5	53	152.6	10.7	13	212.5	14.8	73	272.3	19.0
34	33.9	02.4	94	93.8	06.6	54	153.6	10.7	14	213.5	14.9	74	273.3	19.1
35	34.9	02.4	95	94.8	06.6	55	154.6	10.8	15	214.5	15.0	75	274.3	19.2
36	35.9	02.5	96	95.8	06.7	56	155.6	10.9	16	215.5	15.1	76	275.3	19.2
37	36.9	02.6	97	96.8	06.8	57	156.6	10.9	17	216.5	15.1	77	276.3	19.3
38	37.9	02.7	98	97.8	06.8	58	157.6	11.0	18	217.5	15.2	78	277.3	19.4
39	38.9	02.7	99	98.8	06.9	59	158.6	11.1	19	218.5	15.3	79	278.3	19.4
40	39.9	02.8	100	99.8	07.0	60	159.6	11.2	20	219.5	15.3	80	279.3	19.5
41	40.9	02.9	101	100.8	07.0	161	160.6	11.2	221	220.5	15.4	281	280 3	19.6
42	41.9	02.9	02	101.8	07.1	62	161.6	11.3	22	221.5	15.5	82	281.3	19.7
43	42.9	03.0	03	102.8	07.2	63	162.6	11.4	23	222.5	15.5	83	282.3	19.7
44	43.9	03.1	04	103.8	07.2	64	163.6	11.4	24	223.5	15.6	84	283.3	19.8
45	44.9	03.1	05	104.7	07.3	65	164.6	11.5	25	224.5	15.7	85	284.3	19.9
46	45.9	03.2	06	105.7	07.4	66	165.6	11.6	26	225.5	15.8	86	285.3	19.9
47	46.9	03.3	07	106.7	07.5	67	166.6	11.6	27	226.5	15.8	87	286.3	20.0
48	47.9	03.4	08	107.7	07.5	68	167.6	11.7	28	227.5	15.9	88	287.3	20.1
49	48.9	03.4	09	108.7	07.6	69	168.6	11.8	29	228.5	16.0	89	288.3	20.1
50	49.9	03.5	10	109.7	07.7	70	169.6	11.8	30	229.4	16.0	90	289.3	20.2
51	50.9	03.6	111	110.7	07.7	171	170.6	11.9	231	230.4	16 1	291	290.3	20.3
52	51.9	03.6	12	111.7	07.8	72	171.6	12.0	32	231.4	16.2	92	291.3	20.4
53	52.9	03.7	13	112.7	07.9	73	172.6	12.1	33	232.4	16.2	93	292.3	20.4
54	53.9	03.8	14	113.7	07.9	74	173.6	12.1	34	233.4	16.3	94	293.3	20.5
55	54.9	03.8	15	114.7	08.0	75	174.6	12.2	35	234.4	16.4	95	294.3	20.6
56	55.9	03.9	16	115.7	08.1	76	175.6	12.3	36	235.4	16.4	96	295.3	20.6
57	56.9	04.0	17	116.7	08.2	77	176.6	12.3	37	236.4	16.5	97	296.3	20.7
58	57.9	04.0	18	117.7	08.2	78	177.6	12.4	38	237.4	16.6	98	297.3	20.8
59	58.9	04.1	19	118.7	08.3	79	178.6	12.5	39	238.4	16.7	99	298.3	20.8
60	59.9	04.2	120	119.7	08.4	180	179.6	12.5	240	239.4	16.7	300	299.3	20.9
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 5 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.8	05 3	121	120.5	10.5	181	180.3	15.7	241	240.1	21.0
2	02.0	00.2	62	61.8	05.4	22	121.5	10.6	82	181.3	15.8	42	241.1	21.1
3	03.0	00.3	63	62.8	05.5	23	122.5	10.7	83	182.3	15.9	43	242.1	21.1
4	04.0	00.3	64	63.8	05.6	24	123.5	10.8	84	183.3	16.0	44	243.1	21.2
5	05.0	00.4	65	64.8	05.7	25	124.5	10.9	85	184.3	16.1	45	244.1	21.3
6	06.0	00.5	66	65.7	05.8	26	125.5	11.0	86	185.3	16.2	46	245.1	21.4
7	07.0	00.6	67	66.7	05.8	27	126.5	11.1	87	186.3	16.3	47	246.1	21.5
8	08.0	00.7	68	67.7	05 9	28	127.5	11.2	88	187.3	16 4	48	247.1	21.6
9	09.0	00.8	69	68.7	06.0	29	128.5	11.3	89	188.3	16.4	49	248.1	21.7
10	10.0	00.9	70	69.7	06.1	30	129.5	11.4	90	189.3	16.5	50	249.1	21.8
11	11.0	01.0	71	70.7	06.2	131	130.5	11.4	191	190.3	16.6	251	250.0	21.8
12	12.0	01.0	72	71.7	06.3	32	131.5	11.5	92	191.3	16.7	52	251.0	21.9
13	12.9	01.1	73	72.7	06.4	33	132.5	11.6	93	192.3	16.8	53	252.0	22.0
14	13.9	01.2	74	73.7	06.5	34	133.5	11.7	94	193.3	16.9	54	253.0	22.1
15	14.9	01.3	75	74.7	06.5	35	134.5	11.7	95	194.3	17.0	55	254.0	22.2
16	15.9	01.4	76	75.7	06.6	36	135.5	11.8	96	195.3	17.1	56	255.0	22.3
17	16.9	01.5	77	76.7	06.7	37	136.5	11.9	97	196.3	17.2	57	256.0	22.4
18	17.9	01.6	78	77.7	06.8	38	137.5	12.0	98	197.2	17.3	58	257.0	22.4
19	18.9	01.7	79	78.7	06.9	39	138.5	12.1	99	198.2	17.3	59	258.0	22.5
20	19.9	01.7	80	79.7	07.0	40	139.5	12.2	200	199.2	17.4	60	259.0	22.6
21	20.9	01.8	81	80.7	07.1	141	140.5	12.3	201	200.2	17.5	261	260.0	22.7
22	21.9	01.9	82	81.7	07.2	42	141.5	12.4	02	201.2	17.6	62	261.0	22.8
23	22.9	02.0	83	82.7	07.2	43	142.5	12.4	03	202.2	17.7	63	262.0	22.9
24	23.9	02.1	84	83.7	07.3	44	143.5	12.5	04	203.2	17.7	64	263.0	23.0
25	24.9	02.2	85	84.7	07.4	45	144.4	12.6	05	204.2	17.8	65	264.0	23.1
26	25.9	02.3	86	85.7	07.5	46	145.4	12.7	06	205.2	17.9	66	265.0	23.1
27	26.9	02.4	87	86.7	07.6	47	146.4	12.8	07	206.2	18.0	67	266.0	23.2
28	27.9	02.4	88	87.7	07 7	48	147.4	12.9	08	207.2	18.1	68	267 0	23.3
29	28.9	02.5	89	88.7	07.8	49	148.4	13.0	09	208.2	18.2	69	268.0	23.4
30	29.9	02.6	90	89.7	07.8	50	149.4	13.1	10	209.2	18.3	70	269.0	23.5
31	30.9	02.7	91	90.7	07.9	151	150.4	13.1	211	210.2	18.4	271	270.0	23.6
32	31.9	02.8	92	91.6	08.0	52	151.4	13.2	12	211.2	18.4	72	271.0	23.7
33	32.9	02.9	93	92.6	08.1	53	152.4	13.3	13	212.2	18.5	73	272.0	23.8
34	33.9	03.0	94	93.6	08.2	54	153.4	13.4	14	213.2	18.6	74	273.0	23.8
35	34.9	03.1	95	94.6	08.3	55	154.4	13.5	15	214 2	18.7	75	274.0	23.9
36	35.9	03.1	96	95.6	08.4	56	155.4	13.6	16	215.2	18.8	76	275.0	24.0
37	36.9	03.2	97	96.6	08.5	57	156.4	13.7	17	216 2	18.9	77	275.9	24.1
38	37.9	03.3	98	97.6	08.5	58	157.4	13.7	18	217.2	19.0	78	276.9	24.2
39	38.9	03.4	99	98.6	08.6	59	158.4	13.8	19	218.2	19.1	79	277.9	24.3
40	39.8	03.5	100	99.6	08.7	60	159.4	13.9	20	219.2	19.1	80	278.9	24.4
41	40.8	03.6	101	100.6	08.8	161	160.4	14.0	221	220.2	19.2	281	279.9	24.4
42	41.8	03.7	02	101.6	08.9	62	161.4	14.1	22	221.2	19.3	82	280.9	24.5
43	42.8	03.8	03	102.6	09.0	63	162.4	14.2	23	222.2	19.4	83	281.9	24.6
44	43.8	03.8	04	103.6	09.0	64	163.4	14.3	24	223.1	19.5	84	282.9	24.7
45	44.8	03.9	05	104.6	09.1	65	164.4	14.4	25	224.1	19.6	85	283.9	24.8
46	45.8	04.0	06	105.6	09.2	66	165.4	14.4	26	225.1	19.7	86	284.9	24.9
47	46.8	04.1	07	106.6	09.3	67	166.4	14.5	27	226.1	19.7	87	285.9	25.0
48	47.8	04.2	08	107.6	09.4	68	167.4	14.6	28	227.1	19.8	88	286.9	25.1
49	48.8	04.3	09	108.6	09.5	69	168.4	14.7	29	228.1	19.9	89	287.9	25.1
50	49.8	04.4	10	109.6	09.6	70	169.4	14.8	30	229.1	20.0	90	288.9	25.2
51	50.8	04.4	111	110.6	09.7	171	170.4	14.9	231	230.1	20.1	291	289.9	25.3
52	51.8	04.5	12	111.6	09.7	72	171.3	15.0	32	231.1	20.2	92	290.9	25.4
53	52.8	04.6	13	112.6	09.8	73	172.3	15.1	33	232.1	20.3	93	291.9	25.5
54	53.8	04.7	14	113.6	09.9	74	173.3	15.1	34	233.1	20.4	94	292.9	25.6
55	54.8	04.8	15	114.6	10.0	75	174.3	15.2	35	234.1	20.4	95	293.9	25.7
56	55.8	04.9	16	115.6	10.1	76	175.3	15.3	36	235.1	20.5	96	294.9	25.8
57	56.8	05.0	17	116.6	10.2	77	176.3	15.4	37	236.1	20.6	97	295.9	25.8
58	57.8	05.1	18	117.6	10.3	78	177.3	15.5	38	237.1	20.7	98	296.9	25.9
59	58.8	05.1	19	118.5	10.4	79	178.3	15.6	39	238.1	20.8	99	297.9	26.0
60	59.8	05.2	120	119.5	10.4	180	179.3	15.7	240	239.1	20.9	300	298.9	26.1
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 85 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.7	06.4	121	120.3	12.6	181	180.0	18.9	241	239.7	25.2
2	02.0	00.2	62	61.7	06 5	22	121.3	12.7	82	181.0	19.0	42	240.7	25.3
3	03.0	00.3	63	62.7	06.6	23	122.3	12.9	83	182.0	19.1	43	241.7	25.4
4	04.0	00.4	64	63.6	06.7	24	123.3	13.0	84	183.0	19.2	44	242.7	25.5
5	05.0	00.5	65	64.6	06.8	25	124.3	13.1	85	184.0	19.3	45	243.7	25.6
6	06.0	00.6	66	65.6	06.9	26	125.3	13.2	86	185.0	19.4	46	244.6	25.7
7	07.0	00.7	67	66.6	07.0	27	126.3	13.3	87	186.0	19.5	47	245.6	25.8
8	08.0	00.8	68	67.6	07.1	28	127.3	13.4	88	187.0	19.5	48	246.6	25.9
9	08.9	00.9	69	68.6	07.2	29	128.3	13.5	89	188.0	19.6	49	247.6	26.0
10	09.9	01.0	70	69.6	07.3	30	129.3	13.6	90	189.0	19.9	50	248.6	26.1
11	10.9	01.1	71	70.6	07.4	131	130.3	13.7	191	189.9	20.0	251	249.6	26.2
12	11.9	01.3	72	71.6	07.5	32	131.3	13.8	92	190.9	20.1	52	250.6	26.3
13	12.9	01.4	73	72.6	07.6	33	132.3	13.9	93	191.9	20.2	53	251.6	26.4
14	13.9	01.5	74	73.6	07.7	34	133.3	14.0	94	192.9	20.3	54	252.6	26.5
15	14.9	01.6	75	74.6	07.8	35	134.3	14.1	95	193.9	20.4	55	253.6	26.6
16	15 9	01.7	76	75.6	07.9	36	135.3	14.2	96	194.9	20.5	56	254.6	26.8
17	16.9	01.8	77	76.6	08.0	37	136.2	14.3	97	195.9	20.6	57	255 6	26.9
18	17.9	01.9	78	77.6	08.1	38	137.2	14.4	98	196.9	20.7	58	256.6	27.0
19	18.9	02.0	79	78.6	08.3	30	138.2	14.5	99	197.9	20.8	59	257.6	27.1
20	19.9	02.1	80	79.6	08.4	40	139.2	14.6	200	198.9	20.9	60	258.6	27.2
21	20.9	02.2	81	80.6	08.5	141	140.2	14.7	201	199.9	21.0	261	259.6	27.3
22	21.9	02.3	82	81 5	08.6	42	141.2	14.8	02	200.9	21.1	62	260.6	27.4
23	22.9	02.4	83	82.5	08.7	43	142.2	14.9	03	201.9	21.2	63	261.6	27.5
24	23.9	02.5	84	83.5	08.8	44	143.2	15.0	04	202.9	21.3	64	262.5	27.6
25	24.9	02.6	85	84.5	08.9	45	144.2	15.2	05	203.9	21.4	65	263.5	27.7
26	25.9	02.7	86	85.5	09.0	46	145.2	15.3	06	204.9	21.5	66	264.5	27.8
27	26.9	02.8	87	86.5	09.1	47	146.2	15.4	07	205.9	21.6	67	265.5	27.9
28	27 8	02 9	88	87.5	09.2	48	147.2	15.5	08	206.9	21.7	68	266.5	28.0
29	28.8	03.0	89	88.5	09.3	49	148.2	15.6	09	207.9	21.8	69	267.5	28.1
30	29.8	03 1	90	89.5	09.4	50	149.2	15.7	10	208.8	21.9	70	268.5	28.2
31	30.8	03.2	91	90.5	09.5	151	150.2	15.8	211	209.8	22.0	271	269.5	28.3
32	31.8	03.3	92	91.5	09.6	52	151.2	15.9	12	210.8	22.2	72	270.5	28.4
33	32.8	03.4	93	92.5	09.7	53	152.2	16.0	13	211.8	22.3	73	271.5	28.5
34	33.8	03.6	94	93.5	09.8	54	153.2	16.1	14	212.8	22.4	74	272.5	28.6
35	34.8	03.7	95	94.5	09.9	55	154.1	16.2	15	213.8	22.5	75	273.5	28.7
36	35.8	03.8	96	95.5	10.0	56	155.1	16.3	16	214.8	22.6	76	274.5	28.8
37	36.8	03.9	97	96 5	10.1	57	156.1	16.4	17	215.8	22.7	77	275 5	28.9
38	37.8	04.0	98	97.5	10.2	58	157.1	16.5	18	216.8	22.8	78	276.5	29.1
39	38.8	04.1	99	98.5	10.3	59	158.1	16.6	19	217.8	22.9	79	277.5	29.2
40	39.8	04.2	100	99.5	10 5	60	159.1	16.7	20	218.8	23.0	80	278.5	29.3
41	40.8	04.3	101	100.4	10.6	161	160.1	16.8	221	219.8	23.1	281	279.5	29.3
42	41.8	04.4	02	101.4	10.7	62	161.1	16.9	22	220.8	23.2	82	280.4	29.4
43	42.8	04 5	03	102.4	10.8	63	162.1	17.0	23	221.8	23.3	83	281.4	29.5
44	43.8	04 6	04	103.4	10.9	64	163.1	17.1	24	222.8	23.4	84	282.4	29.6
45	44.8	04.7	05	104.4	11.0	65	164.1	17.2	25	223.8	23.5	85	283.4	29.7
46	45.7	04.8	06	105.4	11.1	66	165 1	17.3	26	224.8	23.6	86	284.4	29.8
47	46.7	04.9	07	106.4	11.2	67	166.1	17.5	27	225.8	23.7	87	285.4	30.0
48	47.7	05.0	08	107.4	11.3	68	167.1	17.6	28	226.7	23.8	88	286.4	30.1
49	48.7	05.1	09	108.4	11.4	69	168.1	17.7	29	227.7	23.9	89	287.4	30.2
50	49.7	05 2	110	109 4	11.5	70	169.1	17.8	30	228.7	24.0	90	288.4	30.3
51	50.7	05.3	111	110.4	11.6	171	170.1	17.9	231	229.7	24.1	291	289.4	30.4
52	51.7	05.4	12	111.4	11.7	72	171.1	18.0	32	230.7	24.2	92	290.4	30.5
53	52.7	05.5	13	112.4	11.8	73	172.0	18.1	33	231.7	24.3	93	291.4	30.6
54	53.7	05.6	14	113.	11.9	74	173.0	18.2	34	232.7	24.5	94	292.4	30.7
55	54.7	05.7	15	114.4	12.0	75	174.0	18.3	35	233.7	24.6	95	293.4	30.8
56	55.7	05.9	16	115.4	12.1	76	175.0	18.4	36	234.7	24.7	96	294.4	30.9
57	56.7	06.0	17	116.4	12.2	77	176.0	18.5	37	235.7	24.8	97	295.4	31.0
58	57.7	06.1	18	117.4	12.3	78	177.0	18.6	38	236.7	24.9	98	296.4	31.1
59	58.7	06.2	19	118.3	12.4	79	178.0	18.7	39	237.7	25.0	99	297.4	31.2
60	59.7	06.2	120	119.3	12.5	80	179.0	18.8	240	238.7	25.1	300	298.4	31.4
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 84 Degrees.

TABLE III. Difference of Latitude and Departure for 7 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.5	07.4	121	120.1	14.7	181	179.6	22.0	241	239.2	29.-
2	02.0	00.2	62	61.5	07.5	22	121.1	14.9	82	180.6	22.2	42	240.2	29.5
3	03.0	00.4	63	62.5	07.7	23	122.1	15.0	83	181.6	22.3	43	241.2	29.6
4	04.0	00.5	64	63.5	07.8	24	123.1	15.1	84	182.6	22.4	44	242.2	29.7
5	05.0	00.6	65	64.5	07.9	25	124.1	15.2	85	183.6	22.5	45	243.2	29.-
6	06.0	00.7	66	65.5	08.0	26	125.1	15.3	86	184.6	22.7	46	244.2	29.-
7	06.9	00.9	67	66.5	08.2	27	126.0	15.5	87	185.6	22.8	47	245.1	30.1
8	07.9	01.0	68	67.5	08.3	28	127.0	15.6	88	186.6	22.9	48	246.1	30.2
9	08.9	01.1	69	68.5	08.4	29	128.0	15.7	89	187.6	23.0	49	247.1	30.3
10	09.9	01.2	70	69.5	08.5	30	129.0	15.8	90	188.6	23.1	50	248.1	30.4
11	10.9	01.3	71	70.5	08.6	131	130.0	16.0	191	189.6	23.3	251	249.1	30.6
12	11.9	01.5	72	71.5	08.8	32	131.0	16.1	92	190.6	23.4	52	250.1	30.7
13	12.9	01.6	73	72.5	08.9	33	132.0	16.2	93	191.6	23.5	53	251.1	30.8
14	13.9	01.7	74	73.4	09.0	34	133.0	16.3	94	192.5	23.6	54	252.1	30.9
15	14.9	01.8	75	74.4	09.1	35	134.0	16.4	95	193.5	23.7	55	253.1	31.0
16	15.9	01.9	76	75.4	09.3	36	135.0	16.6	96	194.5	23.9	56	254.1	31.2
17	16.9	02.1	77	76.4	09.4	37	136.0	16.7	97	195.5	24.0	57	255.1	31.3
18	17.9	02.2	78	77.4	09.5	38	137.0	16.8	98	196.5	24.1	58	256.1	31.4
19	18.9	02.3	79	78.4	09.6	39	138.0	16.9	99	197.5	24.2	59	257.1	31.5
20	19.9	02.4	80	79.4	09.8	40	139.0	17.1	200	198.5	24.4	60	258.1	31.7
21	20.8	02.6	81	80.4	09.9	141	139.9	17.2	201	199.5	24.5	261	259.0	31.8
22	21.8	02.7	82	81.4	10.0	42	140.9	17.3	02	200.5	24.6	62	260.0	31.9
23	22.8	02.8	83	82.4	10.1	43	141.9	17.4	03	201.5	24.7	63	261.0	32.0
24	23.8	02.9	84	83.4	10.2	44	142.9	17.5	04	202.5	24.8	64	262.0	32.1
25	24.8	03.0	85	84.4	10.4	45	143.9	17.7	05	203.5	25.0	65	263.0	32.3
26	25.8	03.2	86	85.4	10.5	46	144.9	17.8	06	204.5	25.1	66	264.0	32.-
27	26.8	03.3	87	86.3	10.6	47	145.9	17.9	07	205.4	25.2	67	265.0	32.-
28	27.8	03.4	88	87.3	10.7	48	146.9	18.0	08	206.4	25.3	68	266.0	32.6
29	28.8	03.5	89	88.3	10.8	49	147.9	18.1	09	207.4	25.4	69	267.0	32.8
30	29.8	03.7	90	89.3	11.0	50	148.9	18.3	10	208.4	25.6	70	268.0	32.9
31	30.8	03.8	91	90.3	11.1	151	149.9	18.4	211	209.4	25.7	271	269.0	33.0
32	31.8	03.9	92	91.3	11.2	52	150.9	18.5	12	210.4	25.8	72	270.0	33.1
33	32.8	04.0	93	92.3	11.3	53	151.9	18.6	13	211.4	25.9	73	271.0	33.2
34	33.7	04.1	94	93.3	11.5	54	152.8	18.7	14	212.4	26.1	74	271.9	33.-
35	34.7	04.3	95	94.3	11.6	55	153.8	18.9	15	213.4	26.2	75	272.9	33.5
36	35.7	04.4	96	95.3	11.7	56	154.8	19.0	16	214.4	26.3	76	273.9	33.6
37	36.7	04.5	97	96.3	11.8	57	155.8	19.1	17	215.4	26.4	77	274.9	33.7
38	37.7	04.6	98	97.3	11.9	58	156.8	19.2	18	216.4	26.5	78	275.9	33.8
39	38.7	04.8	99	98.3	12.1	59	157.8	19.4	19	217.4	26.7	79	276.9	34.-
40	39.7	04.9	100	99.3	12.2	60	158.8	19.5	20	218.4	26.8	80	277.9	34.-
41	40.7	05.0	101	100.2	12.3	161	159.8	19.6	221	219.3	26.9	281	278.9	34.-
42	41.7	05.1	02	101.2	12.4	62	160.8	19.7	22	220.3	27.0	82	279.8	34.3
43	42.7	05.2	03	102.2	12.5	63	161.8	19.8	23	221.3	27.2	83	280.9	34.5
44	43.7	05.4	04	103.2	12.7	64	162.8	20.0	24	222.3	27.3	84	281.9	34.6
45	44.7	05.5	05	104.2	12.8	65	163.8	20.1	25	223.3	27.4	85	282.9	34.7
46	45.7	05.6	06	105.2	12.9	66	164.8	20.2	26	224.3	27.-	86	283.-	34.9
47	46.6	05.7	07	106.2	13.0	67	165.7	20.3	27	225.3	27.6	87	284.8	34.9
48	47.6	05.8	08	107.2	13.1	68	166.7	20.5	28	226.3	27.7	88	285.8	35.1
49	48.6	06.0	09	108.2	13.3	69	167.7	20.6	29	227.3	27.9	89	286.8	35.2
50	49.6	06.1	10	109.2	13.4	70	168.7	20.7	30	228.3	28.0	90	287.8	35.3
51	50.6	06.2	111	110.2	13.5	171	169.7	20.2	231	229.3	28.1	291	288.8	35.4
52	51.6	06.3	12	111.2	13.6	72	170.7	20.9	32	230.3	28.3	92	289.8	35.5
53	52.6	06.5	13	112.2	13.8	73	171.7	21.1	33	231.3	28.4	93	290.8	35.7
54	53.6	06.6	14	113.1	13.9	74	172.7	21.2	34	232.2	28.5	94	291.8	35.8
55	54.6	06.7	15	114.1	14.0	75	173.7	21.3	35	233.2	28.6	95	292.8	35.9
56	55.6	06.8	16	115.1	14.1	76	174.7	21.4	36	234.2	28.7	96	293.8	36.-
57	56.6	06.9	17	116.1	14.2	77	175.7	21.6	37	235.2	28.9	97	294.8	36.2
58	57.6	07.1	18	117.1	14.4	78	176.7	21.7	38	236.2	29.0	98	295.8	36.3
59	58.6	07.2	19	118.1	14.5	79	177.7	21.8	39	237.2	29.1	99	296.8	36.4
60	59.6	07.3	120	119.1	14.6	180	178.7	21.9	240	238.2	29.2	300	297.8	36.5
Dist	Dep	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat

for 83 Degrees.

TABLE III. Difference of Latitude and Departure for 8 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.1	61	60.4	08.5	121	119.8	16.8	181	179.2	25.2	241	238.7	33.5
2	02.0	00.3	62	61.4	08.6	22	120.8	17 0	82	180.2	25.3	42	239.7	33.7
3	03.0	00.4	63	62.4	08.8	23	121.8	17.1	83	181.2	25.5	43	240.6	33.8
4	04.0	00.6	64	63.4	08.9	24	122.8	17.3	84	182.2	25.6	44	241.6	34.0
5	05.0	00.7	65	64.4	09.0	25	123.8	17.4	85	183.2	25.8	45	242.6	34.1
6	05.9	00.8	66	65.4	09.2	26	124.8	17.5	86	184.2	25.9	46	243.6	34.2
7	06.9	01.0	67	66 4	09.3	27	125.8	17.7	87	185.2	26.0	47	244.6	34.4
8	07.9	01.1	68	67.3	09.5	28	126.8	17.8	88	186.2	26.2	48	245.6	34.5
9	08.9	01.3	69	68.3	09.6	29	127.7	18.0	89	187 2	26.3	49	246.6	34.7
10	09.9	01.4	70	69.3	09.7	30	128.7	18.1	90	188.2	26.4	50	247.6	34.8
11	10.9	01.5	71	70.3	09.9	131	129.7	18.2	191	189.1	26.6	251	248.6	34.9
12	11.9	01.7	72	71.3	10.0	32	130.7	18.4	92	190.1	26.7	52	249.6	35.1
13	12.9	01.8	73	72.3	10.2	33	131.7	18.5	93	19101	26.9	53	250.5	35.2
14	13.9	01.9	74	73.3	10.3	34	132.7	18.7	49	192.1	27.0	54	251.5	35.4
15	14.8	02.1	75	74.3	10.4	35	133.7	18.8	95	193.1	27.1	55	252.5	35.5
16	15.8	02.2	76	75.3	10.6	36	134.7	18.9	96	194.1	27.3	56	253.5	35.6
17	16 8	02.4	77	76.3	10.7	37	135.7	19.1	97	195.1	27.4	57	254.5	35.8
18	17.8	02.5	78	77.2	10.9	38	136.7	19.2	98	196.1	27.6	58	255.5	35.9
19	18.8	02.6	79	78.2	11.0	39	137.7	19.3	99	197.1	27.7	59	256.5	36.1
20	19.8	02.8	80	79.2	11.1	40	138.6	19.5	200	198.1	27.8	60	257.5	36.2
21	20.8	02.9	81	80.2	11.3	141	139.6	19.6	201	199.0	28 0	261	258.5	36.3
22	21.8	03.1	82	81.2	11.4	42	140.6	19.8	02	200.0	28.1	62	259.5	36.5
23	22.8	03.2	83	82.2	11.6	43	141.6	19.9	03	201.0	28.3	63	260.4	36.6
24	23.8	03.3	84	83.2	11.7	44	142.6	20.0	04	202.0	28.4	64	261.4	36.7
25	24.8	03.5	85	84.2	11.8	45	143.6	20.2	05	203.0	28.5	65	262.4	36.9
26	25.7	03.6	86	85.2	12.0	46	144.6	20.3	06	204.0	28.7	66	263.4	37.0
27	26.7	03.8	87	86.2	12.1	47	145.6	20.5	07	205.0	28.8	67	264.4	37.2
28	27.7	03.9	88	87.1	12.2	48	146.6	20.6	08	206.0	29.0	68	265.4	37.3
29	28.7	04.0	89	88.1	12.4	49	147.6	20.7	09	207.0	29.1	69	266.4	37.4
30	29.7	04.2	90	89.1	12.5	50	148.5	20.9	10	208.0	29.2	70	267.4	37.6
31	30.7	04.3	91	90.1	12.7	151	149 5	21.0	211	209.0	29.4	271	268.4	37.7
32	31.7	04.5	92	91.1	12.8	52	150.5	21.2	12	209.9	29.5	72	269.4	37.9
33	32.7	04 6	93	92.1	12.9	53	151.5	21.3	13	210.9	29.6	73	270.4	38.0
34	33.7	04.7	94	93.1	13.1	54	152.5	21.4	14	211.9	29 8	74	271.3	38.1
35	34.7	04.9	95	94.1	13.2	55	153.5	21.6	15	212.9	29.9	75	272.3	38.3
36	35.7	05.0	96	95.1	13.4	56	154.5	21.7	16	213.9	30.1	76	273.3	38.4
37	36.6	05.2	97	96.1	13.5	57	155.5	21.9	17	214.9	30.2	77	274.3	38.6
38	37.6	05.4	98	97.0	13.6	58	156.5	22.0	18	215.9	30.3	78	275.3	38.7
39	38.6	05.5	99	98.0	13.8	59	157.5	22.1	19	216.9	30.5	79	276.3	38.8
40	39.6	05.6	100	99.0	13.9	60	158.4	22.3	20	217.9	30.6	80	277.3	39.0
41	40.6	05.7	101	100.0	14.1	161	159.4	22.4	221	218.9	30.8	281	278.3	39.1
42	41.6	05.8	02	101.0	14.2	62	160.4	22.6	22	219.8	30.9	82	279.3	39.3
43	42.6	06.0	03	102.0	14.3	63	161.4	22.7	23	220.8	31.0	83	280.3	39.4
44	43.6	06.1	04	103.0	14 5	64	162.4	22.8	24	221.8	31.2	84	281.2	39.5
45	44.6	06.3	05	104.0	14.6	65	163.4	23.0	25	222.8	31.3	85	282.2	39.7
46	45.6	06.4	06	105.0	14.8	66	164.4	23.1	26	223.8	31.5	86	283.2	39.8
47	46.5	06.5	07	106.0	14.9	67	165.4	23.2	27	224.8	31.6	87	284.2	40.0
48	47.5	06.7	08	107.0	15.0	68	166 4	23.4	28	225.8	31.7	88	285.2	40.1
49	48.5	06.8	09	107.9	15.2	69	167.4	23.5	29	226.8	31.9	89	286.2	40.2
50	49.5	07.0	10	108.9	15.3	70	168.4	23.7	30	227.8	32.0	90	287.2	40.4
51	50.5	07.1	111	109.9	15.5	171	129.3	23.8	231	228.8	32.2	291	288.2	40.5
52	51.5	07.2	12	110.9	15.6	72	170.3	23.9	32	229.7	32.3	92	289.2	40.6
53	52.5	07.4	13	111.9	15.7	73	171.3	24.1	33	230.7	32.4	93	290.2	40.8
54	53.5	07.5	14	112.9	15 9	74	172.3	24.2	34	231.7	32.6	94	291.1	40.9
55	54.5	07.7	15	113.9	16.0	75	173.3	24.3	35	232.7	32.7	95	292.1	41.1
56	55.5	07.8	16	114.9	16.1	76	174.3	24.5	36	233.7	32.9	96	293.1	41.2
57	56 4	07.9	17	115.9	16.3	77	175.3	24.6	37	234.7	33.0	97	294.1	41.3
58	57.4	08.1	18	116.9	16.4	78	176.3	24.7	38	23507	33.1	98	295.1	41.5
59	58.4	08.2	19	117.8	16.6	79	177.3	24.9	39	236.7	33.3	99	296.1	41.6
60	59.4	08.4	120	118.8	16.7	180	178.3	25.1	140	237.7	33.4	300	297.1	41.8
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 82 Degrees.

TABLE III. Difference of Latitude and Departure for 9 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	60.2	09.5	121	119.5	18.9	181	178.8	28.3	241	238.0	37.7
2	02.0	00.3	62	61.2	09.7	22	120.5	19.1	82	179.8	28.5	42	239.0	37.8
3	03.0	00.5	63	62.2	09.9	23	121.5	19.2	83	180.7	28.6	43	240.0	38.0
4	04.0	00.6	64	63.2	10.0	24	122.5	19.4	84	181.7	28.8	44	241.0	38.2
5	04.9	00.8	65	64.2	10.2	25	123.5	19.6	85	182.7	28.9	45	242.0	38.3
6	05.9	00.9	66	65.2	10.3	26	124.5	19.7	86	183.7	29.1	46	243.0	38.5
7	06.9	01.1	67	66.2	10.5	27	125.4	19.9	87	184.7	29.2	47	244.0	38.6
8	07.9	01.3	68	67.2	10.6	28	126.4	20.0	88	185.7	29.4	48	244.9	38.8
9	08.9	01.4	69	68.2	10.8	29	127.4	20.2	89	186.7	29.6	49	245.9	38.9
10	09.9	01.6	70	69.1	10.9	30	128.4	20.3	90	187.7	29.7	50	246.9	39.1
11	10.9	01.7	71	70.1	11.1	131	129.4	20.5	191	188.7	29.9	251	247.9	39.3
12	11.9	01.9	72	71.1	11.3	32	130.4	20.6	92	189.6	30.0	52	248.9	39.4
13	12.9	02.0	73	72.1	11.4	33	131.4	20.8	93	190.6	30.2	53	249.9	39.6
14	13.8	02.2	74	73.1	11.6	34	132.4	21.0	94	191.6	30.3	54	250.9	39.7
15	14.8	02.3	75	74.1	11.7	35	133.3	21.1	95	192.6	30.5	55	251.9	39.9
16	15.8	02.5	76	75.1	11.9	36	134.3	21.3	96	193.6	30.7	56	252.9	40.0
17	16.8	02.7	77	76.1	12.0	37	135.3	21.4	97	194.6	30.8	57	253.8	40.2
18	17.8	02.8	78	77.0	12.2	38	136.3	21.6	98	195.6	31.0	58	254.8	40.4
19	18.8	03.0	79	78.0	12.4	39	137.3	21.7	99	196.6	31.1	59	255.8	40.5
20	19.8	03.1	80	79.0	12.5	40	138.3	21.9	200	197.5	31.3	60	256.8	40.7
21	20.7	03.3	81	80.0	12.7	141	139.3	22.1	201	198.5	31.4	261	257.8	40.8
22	21.7	03.4	82	81.0	12.8	42	140.3	22.2	02	199.5	31.6	62	258.8	41.0
23	22.7	03.6	83	82.0	13.0	43	141.2	22.4	03	200.5	31.7	63	259.8	41.1
24	23.7	03.8	84	83.0	13.1	44	142.2	22.5	04	201.5	31.9	64	260.8	41.3
25	24.7	03.9	85	84.0	13.3	45	143.2	22.7	05	202.5	32.1	65	261.7	41.4
26	25.7	04.1	86	84.9	13.5	46	144.2	22.8	06	203.5	32.2	66	262.7	41.6
27	26.7	04.2	87	85.9	13.6	47	145.2	23.0	07	204.5	32.4	67	263.7	41.8
28	27.7	04.4	88	86.9	13.8	48	146.2	23.1	08	205.4	32.5	68	264.7	41.9
29	28.6	04.5	89	87.9	13.9	49	147.2	23.3	09	206.4	32.7	69	265.7	42.1
30	29.6	04.7	90	88.9	14.1	150	148.2	23.5	10	207.4	32.8	70	266.7	42.2
31	30.6	04.8	91	89.9	14.2	151	149.1	23.6	211	208.4	33.0	271	267.7	42.4
32	31.6	05.0	92	90.9	14.4	52	150.1	23.8	12	209.4	33.2	72	268.7	42.5
33	32.6	05.2	93	91.9	14.5	53	151.1	23.9	13	210.4	33.3	73	269.6	42.7
34	33.6	05.3	94	92.8	14.7	54	152.1	24.1	14	211.4	33.5	74	270.6	42.9
35	34.6	05.5	95	93.8	14.9	55	153.1	24.2	15	212.4	33.6	75	271.6	43.0
36	35.6	05.6	96	94.8	15.0	56	154.1	24.4	16	213.3	33.8	76	272.6	43.2
37	36.5	05.8	97	95.8	15.2	57	155.1	24.6	17	214.3	33.9	77	273.6	43.3
38	37.5	05.9	98	96.8	15.3	58	156.1	24.7	18	215.3	34.1	78	274.6	43.5
39	38.5	06.1	99	97.8	15.5	59	157.0	24.9	19	216.3	34.3	79	275.6	43.6
40	39.5	06.3	100	98.8	15.6	60	158.0	25.0	20	217.3	34.4	80	276.6	43.8
41	40.5	06.4	101	99.8	15.8	161	159.0	25.2	221	218.3	34.6	281	277.5	43.9
42	41.5	06.6	02	100.7	16.0	62	160.0	25.3	22	219.3	34.7	82	278.5	44.1
43	42.5	06.7	03	101.7	16.1	63	161.0	25.5	23	220.3	34.9	83	279.5	44.3
44	43.5	06.9	04	102.7	16.3	64	162.0	25.6	24	221.2	35.0	84	280.5	44.4
45	44.4	07.0	05	103.7	16.4	65	163.0	25.8	25	222.2	35.2	85	281.5	44.6
46	45.4	07.2	06	104.7	16.6	66	164.0	26.0	26	223.2	35.3	86	282.5	44.7
47	46.4	07.4	07	105.7	16.7	67	164.9	26.1	27	224.2	35.5	87	283.5	44.9
48	47.4	07.5	08	106.7	16.9	68	165.9	26.3	28	225.2	35.7	88	284.5	45.0
49	48.4	07.7	09	107.7	17.0	69	166.9	26.4	29	226.2	35.8	89	285.4	45.2
50	49.4	07.8	10	108.6	17.2	70	167.9	26.6	30	227.2	36.0	90	286.4	45.4
51	50.4	08.0	111	109.6	17.4	171	168.9	26.7	231	228.2	36.1	291	287.4	45.5
52	51.4	08.1	12	110.6	17.5	72	169.9	26.9	32	229.1	36.3	92	288.4	45.7
53	52.3	08.3	13	111.6	17.7	73	170.9	27.1	33	230.1	36.4	93	289.4	45.8
54	53.3	08.4	14	112.6	17.8	74	171.9	27.2	34	231.1	36.6	94	290.4	46.0
55	54.3	08.6	15	113.6	18.0	75	172.8	27.4	35	232.1	36.8	95	291.4	46.1
56	55.3	08.8	16	114.6	18.1	76	173.8	27.5	36	233.1	36.9	96	292.4	46.3
57	56.3	08.9	17	115.6	18.3	77	174.8	27.7	37	234.1	37.1	97	293.3	46.5
58	57.3	09.1	18	116.5	18.5	78	175.8	27.8	38	235.1	37.2	98	294.3	46.6
59	58.3	09.2	19	117.5	18.6	7	176.8	28.0	39	236.1	37.4	99	295.3	46.8
60	59.3	09.4	20	118.5	18.8	180	177.8	28.2	240	237.0	37.5	300	296.3	46.9
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 10 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	60.1	10.6	121	119.2	21.0	181	178.2	31.4	241	237.3	41.8
2	02.0	00.3	62	61.1	10.8	22	120.1	21.2	82	179.2	31.6	42	238.3	42.0
3	03.0	00.5	63	62.0	10.9	23	121.1	21.3	83	180.2	31.7	43	239.3	42.1
4	03.9	00.7	64	63.0	11.1	24	122.1	21.5	84	181.2	31.9	44	240.3	42.3
5	04.9	00.9	65	64.0	11.2	25	123.1	21.7	85	182.2	32.1	45	241.3	42.5
6	05.9	01.0	66	65.0	11.4	26	124.1	21.8	86	183.2	32.3	46	242.3	42.7
7	06.9	01.2	67	66.0	11.6	27	125.1	22.0	87	184.2	32.4	47	243.2	42.8
8	07.9	01.4	68	67.0	11.8	28	126.1	22.2	88	185.1	32.6	48	244.2	43.0
9	08.9	01.6	69	68.0	12.0	29	127.0	22.4	89	186.1	32.8	49	245.2	43.2
10	09.8	01.7	70	68.9	12.1	30	128.0	22.5	90	187.1	32.9	50	246.2	43.4
11	10.8	01.9	71	69.9	12.3	131	129.0	22.7	191	188.1	33.1	251	247.2	43.5
12	11.8	02.1	72	70.9	12.5	32	130.0	22.9	92	189.1	33.3	52	248.2	43.7
13	12.8	02.3	73	71.9	12.7	33	131.0	23.1	93	190.1	33.5	53	249.2	43.9
14	13.8	02.4	74	72.9	12.8	34	132.0	23.2	94	191.0	33.6	54	250.1	44.0
15	14.8	02.6	75	73.9	13.0	35	132.9	23.4	95	192.0	33.8	55	251.1	44.2
16	15.8	02.8	76	74.8	13.2	36	133.9	23.6	96	193.0	34.0	56	252.1	44.4
17	16.7	02.9	77	75.8	13.4	37	134.9	23.8	97	194.0	34.2	57	253.1	44.6
18	17.7	03.1	78	76.8	13.5	38	135.9	23.9	98	195.0	34.3	58	254.1	44.7
19	18.7	03.3	79	77.8	13.7	39	136.9	24.1	99	196.0	34.5	59	255.1	44.9
20	19.7	03.5	80	78.8	13.9	40	137.9	24.3	200	197.0	34.7	60	256.0	45.1
21	20.7	03.6	81	79.8	14.0	141	138.9	24.4	201	197.9	34.9	261	257.0	45.3
22	21.7	03.8	82	80.8	14.2	42	139.8	24.6	02	198.9	35.0	62	258.0	45.4
23	22.7	04.0	83	81.7	14.4	43	140.8	24.8	03	199.9	35.2	63	259.0	45.6
24	23.6	04.2	84	82.7	14.6	44	141.8	25.0	04	200.9	35.4	64	260.0	45.8
25	24.6	04.3	85	83.7	14.7	45	142.8	25.1	05	221.9	35.5	65	261.0	46.0
26	25.6	04.5	86	84.7	14.9	46	143.8	25.3	06	202.9	35.7	66	262.0	46.1
27	26.6	04.7	87	85.7	15.1	47	144.8	25.5	07	203.9	35.9	67	262.9	46.3
28	27.6	04.9	88	86.7	15.3	48	145.7	25.7	08	204.8	36.1	68	263.9	46.5
29	28.6	05.0	89	87.6	15.4	49	146.7	25.8	09	205.8	36.2	69	264.9	46.6
30	29.5	05.2	90	88.6	15.6	50	147.7	26.0	10	206.8	36.4	70	265.9	46.8
31	30.5	05.4	91	89.6	15.8	151	148.7	26.2	211	207.8	36.6	271	266.9	47.0
32	31.5	05.5	92	90.6	16.0	52	149.7	26.4	12	208.8	36.8	72	267.9	47.2
33	32.5	05.7	93	91.6	16.1	53	150.7	26.5	13	209.8	36.9	73	268.9	47.3
34	33.5	05.9	94	92.6	16.3	54	151.7	26.7	14	210.7	37.1	74	269.8	47.5
35	34.5	06.1	95	93.6	16.5	55	152.6	26.9	15	211.7	37.3	75	270.8	47.7
36	35.5	06.2	96	94.5	16.6	56	153.6	27.1	16	212.7	37.5	76	271.8	47.9
37	36.4	06.4	97	95.5	16.8	57	154.6	27.2	17	213.7	37.6	77	272.8	48.0
38	37.4	06.6	98	96.5	17.0	58	155.6	27.4	18	214.7	37.8	78	273.8	48.2
39	38.4	06.8	99	97.5	17.2	59	156.6	27.6	19	215.7	38.0	79	274.8	48.4
40	39.4	06.9	100	98.5	17.3	60	157.6	27.7	20	216.7	38.1	80	275.7	48.6
41	40.4	07.1	101	99.5	17.5	161	158.6	27.9	221	217.6	38.3	281	276.7	48.7
42	41.4	07.3	02	100.4	17.7	62	159.5	28.1	22	218.6	38.5	82	277.7	48.9
43	42.3	07.5	03	101.4	17.9	63	160.5	28.3	23	219.6	38.7	83	278.7	49.1
44	43.3	07.6	04	102.4	18.0	64	161.5	28.4	24	220.6	38.8	84	279.7	49.2
45	44.3	07.8	05	103.4	18.2	65	162.5	28.6	25	221.6	39.0	85	280.7	49.4
46	45.3	08.0	06	104.4	18.4	66	163.5	28.8	26	222.6	39.2	86	281.6	49.6
47	46.3	08.1	07	105.4	18.6	67	164.5	29.0	27	223.5	39.4	87	282.6	49.8
48	47.3	08.3	08	106.4	18.7	68	165.4	29.1	28	224.5	39.5	88	283.6	49.9
49	48.3	08.5	09	107.3	18.9	69	166.4	29.3	29	225.5	39.7	89	284.6	50.1
50	49.2	08.7	10	108.3	19.1	70	167.4	29.5	30	226.5	39.9	90	285.6	50.3
51	50.2	08.8	111	109.3	19.2	171	168.4	29.7	231	227.5	40.1	291	286.6	50.5
52	51.2	09.0	12	110.3	19.4	72	169.4	29.8	32	228.5	40.2	92	287.6	50.6
53	52.2	09.2	13	111.3	19.6	73	170.4	30.0	33	229.5	40.4	93	288.5	50.8
54	53.2	09.4	14	112.3	19.8	74	171.4	30.2	34	230.4	40.6	94	289.5	51.0
55	54.2	09.5	15	113.3	19.9	75	172.3	30.3	35	231.4	40.7	95	290.5	51.2
56	55.1	09.7	16	114.2	20.1	76	173.3	30.5	36	232.4	40.9	96	291.5	51.3
57	56.1	09.9	17	115.2	20.3	77	174.3	30.7	37	233.4	41.1	97	292.5	51.5
58	57.1	10.1	18	116.2	20.5	78	175.2	30.9	38	234.4	41.3	98	293.5	51.7
59	58.1	10.2	19	117.2	20.6	79	176.3	31.0	39	235.4	41.4	99	294.5	51.8
60	59.1	10.4	120	118.2	20.8	180	177.3	31.2	240	236.4	41.6	300	295.4	52.0
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 80 Degrees.

TABLE III. Difference of Latitude and Departure for 11 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	59.9	11.6	121	118.8	23.1	181	177.7	34.5	241	236.6	46.0
2	02.0	00.4	62	60.9	11.8	22	119.8	23.3	82	178.6	34.7	42	237.5	46.2
3	02.9	00.6	63	61.8	12.0	23	120.7	23.5	83	179.6	34.9	43	238.5	46 4
4	03.9	00.8	64	62.8	12.2	24	121.7	23.7	84	180.6	35.1	44	239.5	46.6
5	04.9	01.0	65	63.8	12.4	25	123.7	23.9	85	181.6	35.3	45	240.5	46.8
6	05.9	01.1	66	64.8	12.6	26	123.7	24.0	86	182.6	35.5	46	241.5	47.0
7	06.9	01.3	67	65.8	12.8	27	124.7	24.2	87	183.6	35.7	47	242.5	47.1
8	07.9	01.5	68	66.7	13.0	28	125.6	24.4	88	184.5	35.9	48	243.4	47.3
9	08.8	01.7	69	67.7	13.2	29	126.6	24.6	89	185.5	36.1	49	244.4	47.5
10	09.8	01.9	70	68.7	13.4	30	127.6	24.8	90	186.5	36.3	50	245.4	47.7
11	10.8	02.1	71	69.7	13.5	131	128.6	25.0	191	187.5	36.4	251	246.4	47.9
12	11.8	02.3	72	70.7	13.7	32	129.6	25.2	92	188.5	36.6	52	247.4	48.1
13	12.8	02.5	73	71.7	13.9	33	130.6	25.4	93	189.4	36.8	53	248.3	48.3
14	13.7	02.7	74	72.6	14.1	34	131.5	25.6	94	190.4	37.0	54	249.3	48.5
15	14.7	02.9	75	73.6	14.3	35	132.5	25.8	95	191.4	37.2	55	250.3	48.7
16	15.7	03.1	76	74.6	14.5	36	133.5	25.9	96	192 4	37.4	56	251.3	48.8
17	16.7	03.2	77	75.6	14.7	37	134.5	26.1	97	193.4	37.2	57	252.3	49.0
18	17.7	03.4	78	76.6	14.9	38	135.5	26.3	98	194.4	37.8	58	253.2	49.2
19	18.7	03.6	79	77.5	15.1	39	136.4	26.5	99	195.3	38.0	59	254.2	49.4
20	19.6	03.8	80	78.5	15.3	40	137.4	26.7	200	196.3	38 2	60	255.2	49.6
21	20.6	04.0	81	79.5	15.5	141	138.4	26.9	201	197.3	38.4	261	256.2	49.8
22	21.6	04.2	82	80.5	15 6	42	139.4	27.1	02	198.3	38.5	62	257.2	50.0
23	22.6	04.4	83	81.5	15.8	43	140.4	27.3	03	199.3	38.7	63	258.2	50.2
24	23.6	04.6	84	82.5	16.0	44	141.3	27 5	04	200.2	38.9	64	259.1	50.4
25	24.5	04.8	85	83.4	16.2	45	142.3	27.7	05	201.2	39.1	65	260.1	50.6
26	25.5	05.0	86	84.4	16.4	46	143.3	27.9	06	202.2	39.3	66	261.1	50.8
27	26.5	05.2	87	85.4	16.6	47	144.3	28.0	07	203.2	39.5	67	262.1	50.9
28	27.5	05.3	88	86.4	16.8	48	145.3	28.2	08	204.2	39.7	68	263.1	51.1
29	28.5	05.5	89	87.4	17.0	49	146.3	28.4	09	205.2	39.9	69	264.0	51.3
30	29.4	05.7	90	88.3	17.2	50	147.2	28.6	10	206.1	40.1	70	265.0	51.5
31	30.4	05.9	91	89.3	17.4	151	148.2	28.8	211	207.1	40.3	271	266.0	51.7
32	31.4	06.1	92	90.3	17.6	52	149.2	29.0	12	208.1	40.4	72	267.0	51.9
33	32.4	06.3	93	91.3	17.7	53	150.2	29.2	13	209.1	40.6	73	268.0	52.1
34	33.4	06.5	94	92.3	17.9	54	151.2	29.4	14	210.1	40.8	74	269.0	52.3
35	34.4	06.7	95	93.3	18.1	55	152.1	29.6	15	211.0	41.0	75	269.9	52.5
36	35.3	06.9	96	94.2	18.3	56	153.1	29.8	16	212.0	41.2	76	270.9	52.7
37	36.3	07.1	97	95.2	18.5	57	154.1	30.0	17	213.0	41.4	77	271.9	52.9
38	37.3	07.3	98	96.2	18.7	58	155.1	30.1	18	214.0	41.6	78	272.9	53.0
39	38.3	07.4	99	97.2	18.9	59	156.1	30.3	19	215.0	41.8	79	273.9	53.2
40	39.3	07.6	100	98.2	19.1	60	157.1	30.5	20	215.9	42.0	80	274.8	53.4
41	40.2	07.8	101	99.1	19.3	161	158.0	30.7	221	216.9	42.2	281	275.8	53.6
42	41.2	08.0	02	100.1	19.5	62	159.0	30.9	22	217.9	42.4	82	276.8	53.8
43	42.2	08.2	03	101.1	19.7	63	160.0	31.1	23	218.9	42.5	83	277.8	54.0
44	43.2	08.4	04	102.1	19.8	64	161.0	31.3	24	219.9	42.7	84	278.8	54.2
45	44.2	08.6	05	103.1	20.0	65	162.0	31.5	25	220.9	42.9	85	279.8	54.4
46	45.2	08.8	06	104.0	20.2	66	162.9	31.7	26	221.8	43.1	86	280.7	54.6
47	46.1	09.0	07	105.0	20.4	67	163.9	31.9	27	222.8	43.3	87	281.7	54.8
48	47.1	09.2	08	106.0	20.6	68	164.9	32.1	28	223.8	43.5	88	282.7	55.0
49	48.1	09.3	09	107.0	20.8	69	165.9	32.2	29	224.8	43.7	89	283.7	55.1
50	49.1	09.5	10	108.0	21.0	70	166.9	32.4	30	225.8	43.9	90	284.7	55.3
51	50.1	09.7	111	109.0	21.2	171	167.9	32.6	231	226.7	44.1	291	285.6	55.5
52	51.0	09.9	12	109.9	21.4	72	168.8	32.8	32	227.7	44.3	92	286.6	55.7
53	52.0	10.1	13	110.9	21.6	73	169.8	33.0	33	228.7	44.5	93	287.6	55.9
54	53.0	10.3	14	111.9	21.8	74	170.8	33.2	34	229.7	44.6	94	288.6	56.0
55	54.0	10.5	15	112.9	21.9	75	171.8	33.4	35	230.7	44.8	95	289.6	56.3
56	55.0	10.7	16	113.9	22.1	76	172.8	33.6	36	231.7	45.0	96	290.5	56.5
57	56.0	10.9	17	114.8	22.3	77	173.7	33.8	37	232.6	45.2	97	291.5	56.7
58	56.9	11.1	18	115.8	22.5	78	174.7	34.0	38	233.6	45.4	98	292.5	56.9
59	57.9	11.3	19	116.8	22.7	79	175.7	34.2	39	234.6	45.6	99	293.5	57.0
60	58.9	11.4	120	117.8	22.9	180	176.7	34.3	240	235.6	45.8	300	294.5	57.2
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 12 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	59.7	12.7	121	118.3	25.2	181	177.0	37.6	241	235.7	50.1
2	02.0	00.4	62	60.6	12.9	22	119.3	25.4	82	178.0	37.9	42	236.7	50.3
3	02.9	00.6	63	61.6	13.1	23	120.3	25.6	83	179.0	38.1	43	237.7	50.5
4	03.9	00.8	64	62.6	13.3	24	121.3	25.8	84	180.0	38.3	44	238.6	50.8
5	04.9	01.0	65	63.6	13.5	25	122.3	26.0	85	180.9	38.5	45	239.6	51.0
6	05.9	01.2	66	64.5	13.9	26	123.2	26.2	86	181.9	38.7	46	240.6	51.2
7	06.8	01.5	67	65.5	13.9	27	124.2	26.4	87	182.9	38.9	47	241.6	51.4
8	07.8	01.7	68	66.5	14.1	28	125.2	26.6	88	183.9	39.1	48	242.5	51.6
9	08.8	01.9	69	67.5	14.4	29	126.2	26.8	89	184.8	39.3	49	243.5	51.8
10	09.8	02.1	70	68.5	14.6	30	127.1	27.0	90	185.8	39.5	50	244.5	52.0
11	10.8	02.3	71	69.4	14.8	131	128.1	27.2	191	186.8	39.7	251	245.5	52.2
12	11.7	02.5	72	70.4	15.0	32	129.1	27.5	92	187.8	39.9	52	246.5	52.4
13	12.7	02.7	73	71.4	15.2	33	130.1	27.7	93	188.8	40.1	53	247.4	52.6
14	13.7	02.9	74	72.4	15.4	34	131.1	27.9	94	189.7	40.4	54	248.4	52.8
15	14.7	03.1	75	73.4	15.6	35	132.0	28.1	95	190.7	40.6	55	249.4	53.0
16	15.6	03.3	76	74.3	15.8	36	133.0	28.3	96	191.7	40.8	56	250.4	53.2
17	16.6	03.5	77	75.3	16.0	37	134.0	28.5	97	192.7	41.0	57	251.3	53.5
18	17.6	03.7	78	76.3	16.2	38	135.0	28.7	98	193.6	41.2	58	252.3	53.7
19	18.6	04.0	79	77.3	16.4	39	135.9	28.9	99	194.6	41.4	59	253.3	53.9
20	19.6	04.2	80	78.2	16.6	40	136.9	29.1	200	195.6	41.6	60	254.3	54.1
21	20.5	04.4	81	79.2	16.8	141	137.9	29.3	201	196.6	41.8	261	255.3	54.3
22	21.5	04.6	82	80.2	17.1	42	138.9	29.5	02	197.6	42.0	62	256.2	54.5
23	22.5	04.8	83	81.2	17.3	43	139.9	29.7	03	198.5	42.2	63	257.2	54.7
24	23.5	05.0	84	82.2	17.5	44	140.8	30.0	04	199.5	42.4	64	258.2	54.9
25	24.5	05.2	85	83.1	17.7	45	141.8	30.2	05	200.5	42.6	65	259.2	55.1
26	25.4	05.3	86	84.1	17.9	46	142.8	30.4	06	201.5	42.8	66	260.1	55.3
27	26.4	05.6	87	85.1	18.1	47	143.8	30.6	07	202.4	43.1	67	261.1	55.5
28	27.4	05.8	88	86.1	18.3	48	144.7	30.8	08	203.4	43.3	68	262.1	55.7
29	28.4	06.0	89	87.0	18.5	49	145.7	31.0	09	204.4	43.5	69	263.1	56.0
30	29.3	06.2	90	88.0	18.7	50	146.7	31.2	10	205.4	43.7	70	264.1	56.2
31	30.3	06.4	91	89.0	18.9	151	147.7	31.4	211	206.4	43.9	271	265.0	56.4
32	31.3	06.7	92	90.0	19.1	52	148.7	31.6	12	207.3	44.1	72	266.0	56.6
33	32.3	06.9	93	91.0	19.3	53	149.6	31.8	13	208.3	44.3	73	267.0	56.8
34	33.3	07.1	94	91.9	19.6	54	150.6	32.0	14	209.3	44.5	74	268.0	57.0
35	34.2	07.3	95	92.9	19.8	55	151.6	32.2	15	210.3	44.7	75	269.0	57.2
36	35.2	07.5	96	93.9	20.0	56	152.6	32.4	16	211.2	44.9	76	269.9	57.4
37	36.2	07.7	97	94.9	20.2	57	153.5	32.7	17	212.2	45.1	77	270.9	57.6
38	37.2	07.9	98	95.8	20.4	58	154.5	32.9	18	213.2	45.3	78	271.9	57.8
39	38.1	08.1	99	96.8	20.6	59	155.5	33.1	19	214.2	45.6	79	272.9	58.0
40	39.1	08.3	100	97.8	20.8	60	156.5	33.3	20	215.2	45.8	80	273.8	58.2
41	40.1	08.5	101	98.8	21.0	161	157.5	33.5	221	216.1	46.0	281	274.8	58.4
42	41.1	08.7	02	99.8	21.2	62	158.4	33.7	22	217.1	46.2	82	275.8	58.7
43	42.1	08.9	03	100.7	21.4	63	159.4	33.9	23	218.1	46.4	83	276.8	58.9
44	43.0	09.2	04	101.7	21.6	64	160.4	34.1	24	219.1	46.6	84	277.8	59.1
45	44.0	09.4	05	102.7	21.8	65	161.4	34.3	25	220.1	46.8	85	278.7	59.3
46	45.0	09.6	06	103.7	22.0	66	162.3	34.5	26	221.0	47.0	86	279.7	59.5
47	46.0	09.8	07	104.6	22.3	67	163.3	34.7	27	222.0	47.2	87	280.7	59.7
48	46.9	10.0	08	105.6	22.5	68	164.3	34.9	28	223.0	47.4	88	281.7	59.9
49	47.9	10.2	09	106.6	22.7	69	165.3	35.2	29	224.0	47.6	89	282.6	60.1
50	48.9	10.4	10	107.6	22.9	70	166.3	35.4	30	225.0	47.8	90	283.6	60.3
51	49.9	10.6	111	108.6	23.1	171	167.2	35.6	231	225.9	48.0	291	284.6	60.5
52	50.9	10.8	12	109.5	23.3	72	168.2	35.8	32	226.9	48.3	92	285.6	60.7
53	51.8	11.0	13	110.5	23.5	73	169.2	36.0	33	227.9	48.5	93	286.6	60.9
54	52.8	11.2	14	111.5	23.7	74	170.2	36.2	34	228.9	48.7	94	287.5	61.2
55	53.8	11.4	15	112.5	23.9	75	171.2	36.4	35	229.8	48.9	95	288.5	61.4
56	54.8	11.6	16	113.4	24.1	76	172.1	36.6	36	230.8	49.1	96	289.5	61.6
57	55.7	11.9	17	114.4	24.3	77	173.1	36.8	37	231.8	49.3	97	290.5	61.8
58	56.7	12.1	18	115.4	24.5	78	174.1	37.0	38	232.8	49.5	98	291.4	62.0
59	57.7	12.3	19	116.4	24.8	79	175.1	37.2	39	233.7	49.7	99	292.4	62.2
60	58.7	12.5	120	117.4	25.0	180	176.0	37.4	240	234.7	49.9	300	293.4	62.4
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 78 Degrees.

TABLE III. Difference of Latitude and Departure for 13 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.2	61	59.4	13.7	121	117.9	27.2	181	176.4	40.7	241	234.8	54.2
2	01.9	00.4	62	60.4	13.9	22	118.9	27.4	82	177.3	40.9	42	235.8	54.4
3	02.9	00.7	63	61.4	14.2	23	119.8	27.7	83	178.3	41.2	43	236.8	54.7
4	03.9	00.9	64	62.4	14.4	24	120.8	27.9	84	179.3	41.4	44	237.8	54.9
5	04.9	01.1	65	63.3	14.6	25	121.8	28.1	85	180.3	41.6	45	238.7	55.1
6	05.8	01.3	66	64.3	14.8	26	122.8	28.3	86	181.2	41.8	46	239.7	55.3
7	06.8	01.6	67	65.3	15.1	27	123.7	28.6	87	182.2	42.1	47	240.7	55.6
8	07.8	01.8	68	66.3	15.3	28	124.7	28.8	88	183.2	42.3	48	241.6	55.8
9	08.8	02.0	69	67.2	15.5	29	125.7	29.0	89	184.2	42.5	49	242.6	56.0
10	09.7	02.2	70	68.2	15.7	30	126.7	29.2	90	185.1	42.7	50	243.6	56.2
11	10.7	02.5	71	69.2	16.0	131	127.6	29.5	191	186.1	43.0	251	244.6	56.5
12	11.7	02.7	72	70.2	16.2	32	128.6	29.7	92	187.1	43.2	52	245.5	56.7
13	12.7	02.9	73	71.1	16.4	33	129.6	29.9	93	188.1	43.4	53	246.5	56.9
14	13.6	03.1	74	72.1	16.6	34	130.6	30.1	94	189.0	43.6	54	247.5	57.1
15	14.6	03.4	75	73.1	16 9	35	131.5	30.4	95	190.0	43.9	55	248.5	57.4
16	15.6	03.6	76	74.1	17.1	36	132.5	30.6	96	191.0	44.1	56	249.4	57.6
17	16.6	03.8	77	75.0	17.3	37	133.5	30.8	97	192.0	44.3	57	250.4	57.8
18	17.5	04.0	78	76.0	17.5	38	134.5	31.0	98	192.9	44.5	58	251.4	58.0
19	18.5	04.3	79	77.0	17.8	39	135.4	31.3	99	193.9	45.8	59	252.4	58.3
20	19.5	04.5	80	78.0	18.0	40	136.4	31.5	200	194.9	45.0	60	253.3	58.5
21	20.5	04.7	81	78.9	18 2	141	137.4	31.7	201	195.9	45.2	261	254.3	58.7
22	21.4	04 9	82	79.9	18.4	42	138.4	31.9	02	196.8	45.4	62	255.3	58.9
23	22.4	05.2	83	80.9	18.7	43	139.3	32.2	03	197.8	45.7	63	256.3	59.2
24	23.4	05.4	84	81.8	18.9	44	140.3	32.4	04	198.8	46.9	64	257.2	59.4
25	24.4	05.6	85	82.8	19.1	45	141.5	32.6	05	199.7	46.1	65	258.2	59.6
26	25.3	05.8	86	83.8	19.3	46	142.3	32.8	06	200.7	46.3	66	259.2	59.8
27	26.3	06.1	87	84.8	19.6	47	143.2	33.1	07	201 7	46.5	67	260.2	60.1
28	27.3	06.3	88	85.7	19.8	48	144 2	33.3	08	202.7	46.8	68	261.1	60.3
29	28.3	06.5	89	86.7	20.0	49	145.2	33.5	09	203.6	47.0	69	262.1	60.5
30	29 2	06.7	90	87.7	20.2	50	146.2	33.7	10	204.6	47.2	70	263.1	60.7
31	.0.2	07.0	91	88.7	20.5	151	147.1	34.0	211	205.6	47 9	271	264.1	61.0
32	31.2	07.2	92	89.6	20.7	52	148.1	34.2	12	206.6	47.7	72	265 0	61.2
33	32.2	07.4	93	90.6	20.9	53	149.1	34.4	13	207.5	47.9	73	266.0	61.4
34	33.1	07.6	94	91.6	21.1	54	150.1	34.6	14	208.5	48 1	74	267.0	61.6
35	34.1	07.9	95	92.6	21.4	55	151.0	34.9	15	209.5	48.4	75	268.0	61.9
36	35.1	08.1	96	93.5	21.6	56	152.0	35.1	16	210.5	48.6	76	268.9	62.1
37	36.1	08.3	97	94.5	21.8	57	153.0	35.3	17	211.4	48.8	77	269.9	62.3
38	37.0	08.5	98	95.5	22.0	58	154.0	35.5	18	212 4	49.0	78	270.9	62.5
39	38.0	08.8	99	96.5	22.3	59	154.9	35.8	19	213.4	49.3	79	271.9	62.8
40	39.0	08.0	100	97.4	22.5	60	155.9	36.0	20	214.4	49.5	80	272.8	63.0
41	39.9	09.2	101	98.4	22.7	161	156.9	36.2	221	215.3	49.7	281	273.8	63.2
42	40.9	09.4	02	99.4	22.9	62	157.9	36.4	22	216.3	49.9	82	274.8	63.4
43	41.9	09.7	03	100.4	23.2	63	158.8	36.7	23	217.3	50.2	83	275.8	63.7
44	42.0	09.9	04	101.3	23.4	64	159.8	36.9	24	218.3	50.4	84	276.7	63.9
45	43.8	10.1	05	102.3	23.6	65	160.8	37.1	25	219.2	50.6	85	277.7	64.1
46	44.8	10.3	06	103.3	23.8	66	161.7	37.3	26	220.2	50.8	86	278.7	64.3
47	45.8	10.6	07	104.3	24.1	67	162.7	37.6	27	221.2	51.1	87	279.6	64.6
48	46.8	10.8	08	105.2	24.3	68	163.7	37.8	28	222.2	51.3	88	280.6	64.8
49	47.7	11.0	09	106.2	24.5	69	164.7	38.0	29	223.1	51.5	89	281.6	65.0
50	48.7	11.2	10	107.2	24.7	70	165.6	38.2	30	224.1	51.7	90	282.6	65.2
51	49.7	11.5	111	108.2	25.0	171	166.6	38.5	231	225.1	52.0	291	283.5	65.5
52	50.7	11.7	12	109.1	25.2	72	167.6	38.7	32	226.1	52.2	92	284.5	65.7
53	51.6	11.9	13	110.1	25.4	73	168.6	38.9	33	227.0	52.4	93	285.5	65.9
54	52.6	12.1	14	111.1	25.6	74	169.5	39.1	34	228.0	52.6	94	286.5	66.1
55	53.6	12.4	15	112.1	25.9	75	170.5	39.4	35	229.0	52.9	95	287.4	66.4
56	54.6	12.6	16	113.0	26.1	76	171 5	39.6	36	230.0	53.1	96	288.4	66.6
57	55.5	12.8	17	114.0	26.3	77	172.5	39.8	37	230.9	53.3	97	289.4	66.8
58	56.5	13.0	18	115.0	26.5	78	173.4	40.0	38	231.9	53.5	98	290.4	67.0
59	57.5	13.3	19	116.0	26.8	79	174.4	40.2	39	232.9	53.8	99	291.3	67.3
60	58.5	13.5	120	116.9	27.0	180	175.4	40.5	240	233.9	54.0	300	292.3	67.5
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 77 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	D.st	Lat.	Dep
1	01.0	00.2	61	59.2	14.8	121	117.4	29.3	181	175.6	43.8	241	233.8	58.3
2	01.9	00.5	62	60.2	15.0	22	118.4	29.5	82	176.6	44.0	42	234.8	58.6
3	02.9	00.7	63	61.1	15.2	23	119.3	29.8	83	177.6	44.3	43	235.8	58.8
4	03.9	01.0	64	62.1	15.5	24	120.3	30.0	84	178.5	44.5	44	236.7	59.0
5	04.9	01.2	65	63.1	15.7	25	121.3	30.2	85	179.5	44.8	45	237.7	59.3
6	05.8	01.5	66	64.0	16.0	26	122.3	30.5	86	180.5	45.0	46	238.7	59.5
7	06.8	01.7	67	65.0	16.2	27	123.2	30.7	87	181.4	45.3	47	239.7	59.8
8	07.8	01.9	68	66.0	16.5	28	124.2	31.0	88	182.4	45.5	48	240.6	60.0
9	08.7	02.2	69	66.9	16.7	29	125.2	31.2	89	183.4	45.7	49	241.6	60.3
10	09.7	02.4	70	67.9	16.9	30	126.1	31.5	90	184.4	46.0	50	242.6	60.5
11	10.7	02.7	71	68.9	17.2	131	127.1	31.7	191	185.3	46.2	251	243.5	60.7
12	11.6	02.9	72	69.9	17.4	32	128.1	31.9	92	186.3	46.5	52	244.5	61.0
13	12.6	03.1	73	70.8	17.7	33	129.0	32.2	93	187.3	46.7	53	245.5	61.2
14	13.6	03.4	74	71.8	17.9	34	130.0	32.4	94	188.2	46.9	54	246.4	61.5
15	14.6	03.6	75	72.8	18.1	35	131.0	32.7	95	189.2	47.2	55	247.4	61.7
16	15.5	03.9	76	73.7	18.4	36	132.0	32.9	96	190.2	47.4	56	248.4	62.0
17	16.5	04.1	77	74.7	18.6	37	132.9	33.2	97	191.1	47.7	57	249.4	62.2
18	17.5	04.4	78	75.7	18.9	38	133.9	33.4	98	192.1	47.9	58	250.3	62.4
19	18.4	04.6	79	76.7	19.1	39	134.9	33.6	99	193.1	48.2	59	251.3	62.7
20	19.4	04.8	80	77.6	19.4	40	135.8	33.9	200	194.1	48.4	60	252.3	62.9
21	20.4	05.1	81	78.6	19.6	141	136.8	34.1	201	195.0	48.6	261	253.2	63.2
22	21.3	05.3	82	79.6	19.8	42	137.8	34.4	02	196.0	48.9	62	254.2	63.4
23	22.3	05.6	83	80.5	20.1	43	138.7	34.6	03	197.0	49.1	63	255.2	63.6
24	23.3	05.8	84	81.5	20.3	44	139.7	34.8	04	197.9	49.4	64	256.2	63.9
25	24.3	06.0	85	82.5	20.6	45	140.7	35.1	05	198.9	49.6	65	257.1	64.1
26	25.2	06.3	86	83.4	20.8	46	141.7	35.3	06	199.9	49.9	66	258.1	64.4
27	26.2	06.5	87	84.4	21.1	47	142.6	35.6	07	200.8	50.1	67	259.1	64.6
28	27.2	06.8	88	85.4	21.3	48	143.6	35.8	08	201.8	50.3	68	260.0	64.9
29	28.1	07.0	89	86.4	21.5	49	144.6	36.1	09	202.8	50.6	69	261.0	65.1
30	29.1	07.3	90	87.3	21.8	50	145.5	36.3	10	203.8	50.8	70	262.0	65.3
31	30.1	07.5	91	88.3	22.0	151	146.5	36.5	211	204.7	51.1	271	262.9	65.6
32	31.0	07.7	92	89.3	22.3	52	147.5	36.8	12	205.7	51.3	72	263.9	65.8
33	32.0	08.0	93	90.2	22.5	53	148.5	37.0	13	206.7	51.5	73	264.9	66.1
34	33.0	08.2	94	91.2	22.7	54	149.4	37.3	14	207.6	51.8	74	265.9	66.3
35	34.0	08.5	95	92.2	23.0	55	150.4	37.5	15	208.6	52.0	75	266.8	66.5
36	34.9	08.7	96	93.1	23.2	56	151.4	37.7	16	209.6	52.3	76	267.8	66.8
37	35.9	09.0	97	94.1	23.5	57	152.3	38.0	17	210.5	52.5	77	268.8	67.0
38	36.9	09.2	98	95.1	23.7	58	153.3	38.2	18	211.5	52.8	78	269.7	67.3
39	37.8	09.4	99	96.1	24.0	59	154.3	38.5	19	212.5	53.0	79	270.7	67.5
40	38.8	09.7	100	97.0	24.2	60	155.2	38.7	20	213.5	53.2	80	271.7	67.8
41	39.8	09.9	101	98.0	24.4	161	156.2	39.0	221	214.4	53.5	281	272.6	68.0
42	40.8	10.2	02	99.0	24.7	62	157.2	39.2	22	215.4	53.7	82	273.6	68.2
43	41.7	10.4	03	99.9	24.9	63	158.2	39.4	23	216.4	54.0	83	274.6	68.5
44	42.7	10.6	04	100.9	25.2	64	159.1	39.7	24	217.3	54.2	84	275.6	68.7
45	43.7	10.9	05	101.9	25.4	65	160.1	39.9	25	218.3	54.4	85	276.5	69.0
46	44.6	11.1	06	102.8	25.7	66	161.1	40.2	26	219.3	54.7	86	277.5	69.2
47	45.6	11.4	07	103.8	25.9	67	162.0	40.4	27	220.3	54.9	87	278.5	69.5
48	46.6	11.6	08	104.8	26.1	68	163.0	40.7	28	221.2	55.2	88	279.4	69.7
49	47.5	11.9	09	105.8	26.4	69	164.0	40.9	29	222.2	55.4	89	280.4	69.9
50	48.5	12.1	10	106.7	26.6	70	164.9	41.1	30	223.2	55.7	90	281.4	70.2
51	49.5	12.3	111	107.7	26.9	171	165.9	41.4	231	224.1	55.9	291	282.3	70.4
52	50.5	12.6	12	108.7	27.1	72	166.9	41.6	32	225.1	56.1	92	283.3	70.7
53	51.4	12.8	13	109.6	27.3	73	167.9	41.9	33	226.1	56.4	93	284.3	70.9
54	52.4	13.1	14	110.6	27.6	74	168.8	42.1	34	227.0	56.6	94	285.3	71.1
55	53.4	13.	15	111.6	27.8	75	169.8	42.3	35	228.0	56.9	95	286 2	71.4
56	54.3	13.6	16	112.6	28.1	76	170.8	42.6	36	229.0	57.1	96	287.2	71.6
57	55.3	13.8	17	113.	28.3	77	171.7	42.8	37	230.0	57.4	97	288.2	71.9
58	56.3	14.6	18	114.9	28.6	78	172.7	43.1	38	230.9	57.6	98	289.1	72.1
59	57.2	14.3	19	115.9	28.8	79	173.7	43.3	39	231.9	57.8	99	290.1	72.4
60	58.2	14.5	120	116.4	29.0	180	174.6	43.6	140	232.9	58.1	300	291.1	72.6
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 15 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.3	61	58.9	15.8	121	116.9	31.3	181	174.8	46.8	241	232.8	62.4
2	01.9	00.5	62	59.9	16.0	22	117.8	31.6	82	175.8	47.1	42	233.7	62.6
3	02.9	00.8	63	60.9	16.3	23	118.8	31.8	83	176.8	47.4	43	234.7	62.9
4	03.9	01.0	64	61.8	16.6	24	119.8	32.1	84	177.7	47.6	44	235.7	63.1
5	04.8	01.3	65	62.8	16.8	25	120.7	32.4	85	178.7	47.9	45	236.6	63.4
6	05.8	01.6	66	63.7	17.1	26	121.7	32.6	86	179.7	48.1	46	237.6	63.7
7	06.8	01.8	67	64.7	17.3	27	122.7	32.9	87	180.6	48.4	47	238.6	63.9
8	07.7	02.1	68	65.7	17.6	28	123.6	33.1	88	181.6	48.7	48	239.5	64.2
9	08.7	02.3	69	66.6	17.9	29	124.6	33.4	89	182.6	48.9	49	240.5	64.4
10	09.7	02.6	70	67.6	18.2	30	125.6	33.6	90	183.5	49.2	50	241.5	64.7
11	10.6	02.8	71	68.6	18.4	131	126.5	33.9	191	184.5	49.4	251	242.4	65.0
12	11.6	03.1	72	69.5	18.6	32	127.5	34.2	92	185.5	49.7	52	243.4	65.2
13	12.6	03.4	73	70.5	18.9	33	128.5	34.4	93	186.4	49.9	53	244.4	65.5
14	13.5	03.6	74	71.5	19.2	34	129.4	34.7	49	187.4	50.2	54	245.3	65.7
15	14.5	03.9	75	72.4	19.4	35	130.4	34.9	95	188.4	50.5	55	246.3	66.0
16	15.5	04.1	76	73.4	19.7	36	131.4	35.2	96	189.3	50.7	56	247.3	66.3
17	16.4	04.4	77	74.4	19.9	37	132.3	35.5	97	190.3	51.0	57	248.2	66.5
18	17.4	04.7	78	75.3	20.2	38	133.3	35.7	98	191.2	51.2	58	249.2	66.8
19	18.4	04.9	79	76.3	20.4	39	134.3	36.0	99	192.2	51.5	59	250.2	67.0
20	19.3	05.1	80	77.3	20.7	40	135.2	36.2	200	193.2	51.8	60	251.1	67.3
21	20.3	05.4	81	78.2	21.0	141	136.2	36.5	201	194.1	52.0	261	252.1	67.5
22	21.2	05.7	82	79.2	21.2	42	137.2	36.7	02	195.1	52.3	62	253.1	67.8
23	22.2	06.0	83	80.2	21.5	43	138.1	37.0	03	196.1	52.5	63	254 0	68.1
24	23.2	06.2	84	81.1	21.7	44	139.1	37.3	04	197.0	52.8	64	255.0	68.3
25	24.1	06.5	85	82.1	22.0	45	140.1	37.5	05	198.0	53.1	65	256.0	68.6
26	25.1	06.7	86	83.1	22.3	46	141.0	37.8	06	199.0	53.3	66	256.5	68.8
27	26.1	07.0	87	84.0	22.5	47	142.0	38.0	07	199.9	53.6	67	257.9	69.1
28	27.0	07.2	88	85.0	22.8	48	143.0	38.3	08	200.9	53.8	68	258.9	69.4
29	28.0	07.5	89	86.0	23.0	49	143.9	38.6	09	201.9	54.1	69	259.8	69.6
30	29.0	07.8	90	86.9	23.3	50	144.9	38.8	10	202.8	54.3	70	260.8	69.9
31	29.9	08.0	91	87.9	23.6	151	145.8	39.1	211	203.8	54.6	271	261.8	70.1
32	30.9	08.3	92	88.9	23.8	52	146.8	39.3	12	204.8	54.9	72	262.7	70.4
33	31.9	08.5	93	89.8	24.1	53	147.8	39.6	13	205.7	55.1	73	263.7	70.7
34	32.8	08.8	94	90.8	24.3	54	148.7	39.9	14	206.7	55.4	74	264.7	70.9
35	33.8	09.1	95	91.8	24.6	55	149.7	40.1	15	207.7	55.6	75	265.6	71.2
36	34.8	09.3	96	92.7	24.8	56	150.7	40.4	16	208.6	55.9	76	266.6	71.4
37	35.7	09.6	97	93.7	25.1	57	151.6	40.6	17	209.6	56.1	77	267.6	71.7
38	36.7	09.8	98	94.7	25.4	58	152.6	40.9	18	210.6	56.4	78	268.5	71.9
39	37.7	10.1	99	95.6	25.6	59	153.6	41.1	19	211.5	56.7	79	269.5	72.2
40	38.6	10.4	100	96.6	25.9	60	154.5	41.4	20	212.5	56.9	80	270.5	72.5
41	39.6	10.6	101	97.6	26.1	161	155.5	41.7	221	213.5	57.2	281	271.4	72.7
42	40.6	10.9	02	98.5	26.4	62	156.5	41.9	22	214.4	57.5	82	272.4	73.0
43	41.5	11.1	03	99.5	26.7	63	157.4	42.2	23	215.4	57.7	83	273.4	73.2
44	42.5	11.4	04	100.5	26.9	64	158.4	42.4	24	216.4	58.0	84	274.3	73.5
45	43.5	11.6	05	101.4	27.2	65	159.4	42.7	25	217.3	58.2	85	275.3	73.8
46	44.4	11.9	06	102.4	27.4	66	160.3	43.0	26	218.3	58.5	86	276.2	74 0
47	45.4	12.2	07	103.4	27.7	67	161.3	43.2	27	219.3	58.7	87	277.2	74 3
48	46.4	12.4	08	104.3	28.0	68	162.3	43.5	28	220.2	59.0	88	278.2	74.5
49	47.3	12.7	09	105.3	28.2	69	163.2	43.7	29	221.2	59.3	89	279.1	74.8
50	48.3	12.9	10	106.2	28.5	70	164.2	44.0	30	222.2	59.5	90	280 1	75.0
51	49.3	13.2	111	107.2	28.7	171	165.2	44.3	231	223.1	59.8	291	281.1	75.3
52	50.2	13.5	12	108.2	29.0	72	166.1	44.5	32	224.1	60.0	92	282.0	75.6
53	51.2	13.7	13	109.1	29.2	73	167.1	44.8	33	225.1	60.3	93	283.0	75.8
54	52.2	14.0	14	110.1	29.5	74	168.1	45.0	34	226.0	60.6	94	284.0	76.1
55	53.1	14.2	15	111.1	29.8	75	169 0	45.3	35	227.0	60.8	95	284.9	76.3
56	54.1	14.5	16	112.0	30.0	76	170.0	45.5	36	228.0	61.1	96	285.9	76.6
57	55.1	14.8	17	113.0	30.3	77	171.0	45.8	37	228.9	61.3	97	286.9	76.9
58	56.0	15.0	18	114.0	30.5	78	171.9	46.1	38	229.9	61.6	98	287.8	77.1
59	57.0	15.3	19	114.9	30.8	79	172.9	46.3	39	230.9	61.9	99	288.8	77.4
60	58.0	15.5	120	115.9	31.1	180	173.9	46.6	240	231.8	62.1	300	289.8	77.6
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat

for 75 Degrees.

TABLE III. Difference of Latitude and Departure for 16 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.3	61	58.6	16.8	121	116.3	33.3	181	174.0	49.9	241	231.6	66.4
2	01.9	00.6	62	59.6	17.1	22	117.3	33.6	82	174.9	50.2	42	232.6	66.7
3	02.9	00.8	63	60.6	17.4	23	118.2	33.9	83	175.9	50.4	43	233.6	67.0
4	03.8	01.1	64	61.5	17.6	24	119.2	34.2	84	176.8	50.7	44	234.5	67.2
5	04.8	01.4	65	62.5	17.9	25	120.1	34.4	85	177.8	51.0	45	235.5	67.5
6	05.8	01.7	66	63.4	18.2	26	121.1	34.7	86	178.8	51.3	46	236.4	67.8
7	06.7	01.9	67	64.4	18.5	27	122.1	35.0	87	179.7	51.5	47	237.4	68.1
8	07.7	02.2	68	65.4	18.7	28	123.0	35.3	88	180.7	51.8	48	238.4	68.3
9	08.7	02.5	69	66.3	19.0	29	124.0	35.6	89	181.7	52.1	49	239.3	68.6
10	09.6	02.8	70	67.3	19.3	30	124.9	35.8	90	182.6	52.4	50	240.3	68.9
11	10.6	03.0	71	68.2	19.6	131	125.9	36.1	191	183.6	52.6	251	241.2	69.2
12	11.5	03.3	72	69.2	19.8	32	126.9	36.4	92	184.5	52.9	52	242.2	69.5
13	12.5	03.6	73	70.2	20.1	33	127.8	36.7	93	185.5	53.2	53	243.2	69.7
14	13.5	03.9	74	71.1	20.4	34	128.8	36.9	94	186.5	53 5	54	244.1	70.0
15	14.4	04.1	75	72.1	20.7	35	129.8	37.2	95	187.4	53.7	55	245.1	70.3
16	15.4	04.4	76	73.0	20.9	36	130.7	37.5	96	188.4	54.0	56	246.0	70.6
17	16.3	04.7	77	74.0	21.2	37	131.7	37.8	97	189.3	54.3	57	247.0	70.8
18	17.3	05.0	78	75.0	21.5	38	132.6	38.0	98	190.3	54.6	58	248.0	71.1
19	18.3	05.2	79	75.9	21.8	39	133.6	38.3	99	191.3	54.8	59	248.9	71.4
20	19.2	05.5	80	76.9	22.0	40	134.6	38.6	200	192.2	55.1	60	249.9	71.7
21	20.2	05.8	81	77.9	22.3	141	135.5	38.9	201	193.2	55.4	261	250.9	71.9
22	21.1	06.1	82	78.8	22.6	42	136.5	39.1	02	194.1	55.7	62	251.8	72.2
23	22.1	06.3	83	79.8	22.9	43	137.4	39.4	03	195.1	55.9	63	252.8	72.5
24	23.1	06.6	84	80.7	23.1	44	138.4	39.7	04	196.1	56.2	64	253.7	72.8
25	24.0	06.9	85	81.7	23.4	45	139.4	40.0	05	197.0	56.5	65	254.7	73.0
26	25.0	07.2	86	82.7	23.7	46	140.3	40.2	06	198.0	56.8	66	255.7	73.3
27	26.0	07.4	87	83.6	24.0	47	141.3	40.5	07	199.0	57.0	67	256.6	73.6
28	26.9	07.7	88	84.6	24.3	48	142.2	40.8	08	199.9	57.3	68	257.6	73.9
29	27 9	08.0	89	85.5	24.5	49	143.2	41.1	09	200.0	57.6	69	258.5	74.1
30	28.8	08.3	90	86.5	24.8	50	144.2	41.3	10	201.8	57.9	70	259.5	74.4
31	29.8	08.5	91	87.5	25.1	151	145.1	41.6	211	202.8	58.2	271	260.5	74.7
32	30.8	08.8	92	88.4	25.4	52	146.1	41.9	12	203.8	58.4	72	261.4	75.0
33	31.7	09.1	93	89.4	25.6	53	147.1	42.2	13	204.7	58.7	73	262.4	75.2
34	32.7	09.4	94	90.3	25.9	54	148.0	42.4	14	205.7	59.0	74	263.3	75.5
35	33.6	09.6	95	91.3	26.2	55	149.0	42.7	15	206.6	59.3	75	264.3	75.8
36	34.6	09.9	96	92.3	26.5	56	149.9	43.0	16	207.6	59.5	76	265.3	76.1
37	35.6	10.2	97	93.2	26.7	57	150.9	43.3	17	208.6	59.8	77	266.2	76.3
38	36.5	10.5	98	94.2	27.0	58	151.9	43.5	18	209.5	60.1	78	267.2	76.6
39	37.5	10.7	99	95.2	27.3	59	152.8	43.8	19	210.5	60.4	79	268.2	76.9
40	38.4	11.0	100	96.1	27.6	60	153.8	44.1	20	211.4	60 6	80	269.1	77.2
41	39.4	11.3	101	97.1	27 8	161	154.7	44.4	221	212.4	60.9	281	270.1	77.4
42	40.4	11.6	02	98.0	28.1	62	155.7	44.6	22	213.4	61.2	82	271.0	77.7
43	41.3	11.9	03	99.0	28.4	63	156.7	44.9	23	214.3	61.5	83	272.0	78.0
44	42.3	12.1	04	100.0	28.7	64	157.6	45.2	24	215.3	61.7	84	273.0	78.3
45	43.3	12.4	05	100.9	28.9	65	158.6	45.5	25	216.3	62.0	85	274.9	78.5
46	44.2	12.7	06	101.9	29.2	66	159.5	45.7	26	217.2	62.3	86	274.9	78.8
47	45 2	13.0	07	102.8	29.5	67	160.5	46.0	27	218.2	62.6	87	275.8	79.1
48	46.1	13.2	08	103.8	29.8	68	161.5	46.3	28	219.1	62.8	88	276.8	79.4
49	47.1	13.5	09	104.8	30.0	69	162.4	46.6	29	220.1	63.1	89	277.8	79.6
50	48.1	13.8	10	105.7	30.3	70	163.4	46.9	30	221.1	63.4	90	278 7	79.9
51	49.0	14.1	111	106.7	30.6	171	164.4	47.1	231	222.0	63.7	291	279.7	80.2
52	50.0	14.3	12	107.6	30.9	72	165.3	47.4	32	223.0	63.9	92	280.6	80.5
53	50.9	14.6	13	108.6	31.1	73	166.3	47.7	33	223.9	64.2	93	281.6	80.8
54	51.9	14.9	14	109.6	31.4	74	167.2	48.0	34	224.9	64.5	94	282.6	81.0
55	52.9	15 2	15	110.5	31.7	75	168.2	48.2	35	225.9	64 8	95	283.5	81.3
56	53.8	15.4	16	111.5	32.0	76	169.2	48.5	36	226.8	65.0	96	284.5	81.6
57	54.8	15.7	17	112.5	32.2	77	170.1	48.8	37	227.8	65.3	97	285.5	81.9
58	55.7	16.0	18	113.4	32.5	78	171.1	49.1	38	228.7	65.6	98	286.4	82.1
59	56.7	16.3	19	114.4	32.8	79	172.0	49.3	39	229.7	65.9	99	287.4	82.4
60	57.7	16.5	120	115.3	33 1	180	173.0	49.6	240	230.7	66.1	300	288.3	82.7
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 74 Degrees.

Table III. Difference of Latitude and Departure for 17 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.3	61	58.3	17.8	121	115.7	35.4	181	173.1	52.9	241	230.5	70.4
2	01.9	00.6	62	59.3	18.1	22	116.7	35.7	82	174.0	53.2	42	231.4	70 7
3	02.9	00.9	63	60.2	18.4	23	117.6	36.0	83	175.0	53.5	43	232.4	71.0
4	03.8	01.2	64	61.2	18.7	24	118.6	36.2	84	175.9	53.8	44	233.3	71.3
5	04.8	01.5	65	62.2	19.0	25	119.5	36.5	85	176.9	54.1	45	234.3	71.6
6	05.7	01.8	66	63.1	19.3	26	120.5	36.8	86	177.9	54.4	46	235.2	71.9
7	06.7	02.0	67	64.1	19.6	27	121.4	37.1	87	178.8	54.7	47	236.2	72.1
8	07.6	02.3	68	65.9	19.9	28	122.4	37.4	88	179.8	55.0	48	237.1	72.4
9	08.6	02.6	69	66.0	20.2	29	123.4	37.7	89	180.7	55.2	49	238.1	72.7
10	09.6	02.9	70	66.9	20.5	30	124.3	38.0	90	181.7	55.5	50	239.1	73.0
11	10.5	03.2	71	67.9	20.8	131	125.3	38.3	191	182.6	55.8	251	240.0	73.3
12	11.5	03.5	72	68.8	21.0	32	126.2	38.6	92	183.6	56.1	52	241.0	73.6
13	12.4	03.8	73	69.8	21.3	33	127.2	38.9	93	184.6	56.4	53	241.9	73.9
14	13.4	04.1	74	70.8	21.6	34	128.1	39.2	94	185.5	56.7	54	242.9	74.1
15	14.3	04.4	75	71.7	21.9	35	129.1	39.5	95	186.5	57.0	55	243.8	74.4
16	15.3	04.7	76	72.7	22.2	36	130.0	39.8	96	187.4	57.3	56	244.8	74.7
17	16.3	05.0	77	73.6	22.5	37	131.0	40.0	97	188.4	57.6	57	245.8	75.0
18	17.2	05.3	78	74.6	22.8	38	132.0	40.3	98	189.3	57.9	58	246.7	75.3
19	18.2	05.6	79	75.5	23.1	39	132 9	40.6	99	190.3	58.2	59	247.7	75.6
20	19 1	05.8	80	76.5	23.4	40	133.9	40.9	200	191.2	58.5	60	248.6	75.9
21	20.1	06.1	81	77.5	23.7	141	134.8	41.2	201	192.2	58.8	261	249.6	76.2
22	21.0	06.4	82	78.4	24.0	42	135.8	41.5	02	193.2	59.0	62	250.5	76.5
23	22.0	06.7	83	79.4	24.3	43	136.7	41.8	03	194.1	59.3	63	251.5	76.8
24	22.9	07.0	84	80.3	24.6	44	137.7	42.1	04	195.1	59.6	64	252.4	77.1
25	23.9	07.3	85	81.3	24.8	45	138.7	42.4	05	196.0	59.9	65	253.4	77.4
26	24.9	07.6	86	82.2	25.1	46	139.6	42.7	06	197.0	60.2	66	254.4	77.7
27	25.8	07.9	87	83.2	25.4	47	140.6	43.0	07	197.9	60.5	67	255.3	77.9
28	26.8	08.2	88	84.1	25.7	48	141.5	43.3	08	198.9	60.8	68	256.3	78.2
29	27.7	08.5	89	85.1	26.0	49	142.5	43.6	09	199.8	61.1	69	257.2	78.5
30	28.7	08.8	90	86.1	26.3	50	143.4	43.8	10	200.8	61.4	70	258.2	78.8
31	29.6	09.1	91	87.0	26.6	151	144.4	44.1	211	201.8	61.7	271	259.1	79.1
32	30.6	09.4	92	88.0	26.9	52	145.3	44.4	12	202.7	62.0	72	260.1	79.4
33	31.6	09.6	93	88.9	27.2	53	146.3	44.7	13	203.7	62.3	73	261.1	79.7
34	32.5	09.9	94	89.9	27.5	54	147.3	45.0	14	204.6	62.6	74	262.0	80.0
35	33.5	10.2	95	90.8	27.8	55	148.2	45.3	15	205.6	62.8	75	263.0	80.3
36	34.4	10.5	96	91.8	28.1	56	149.2	45.6	16	206.5	63.1	76	263.9	80.6
37	35.4	10.8	97	92.8	28.4	57	150.1	45.9	17	207.5	63.4	77	264.9	80.9
38	36.3	11.1	98	93.7	28.6	58	151.1	46.2	18	208.5	63.7	78	265.8	81.2
39	37.3	11.4	99	94.7	28.9	59	152.0	46.5	19	209.4	64.0	79	266.8	81.4
40	38.2	11.7	100	95.6	29.2	60	153.0	46.8	20	210.4	64.3	80	267.7	81.7
41	39.2	12.0	101	96.6	29.5	161	154.0	47.1	221	211.3	64.6	281	268 7	82.0
42	40.2	12.3	02	97.5	29.8	62	154.9	47.4	22	212.3	64.9	82	269.7	82.3
43	41.1	12.6	03	98.5	30.1	63	155 9	47.6	23	213.2	65.2	83	270.6	82.6
44	42.1	12.9	04	99.4	30.4	64	156.8	47.9	24	214.2	65.5	84	271.6	82.9
45	43.0	13.2	05	100.4	30.7	65	157.8	48.2	25	215.2	65.8	85	272.5	83.2
46	44.0	13.4	06	101.4	31.0	66	158.7	48.5	26	216.1	66.1	86	273.5	83.5
47	44.9	13.7	07	102.3	31.3	67	159.7	48.8	27	217.1	66.4	87	274.4	83.8
48	45.9	14.0	08	103.3	31.6	68	160.6	49.1	28	218.0	66.6	88	275.4	84.1
49	46.9	14.3	09	104.2	31.9	69	161.6	49.4	29	219.0	66.9	89	276.4	84.4
50	47.8	14.6	10	105.2	32.2	70	162.6	49.7	30	219.9	67.2	90	277.3	84.7
51	48.8	14 9	111	106.1	32.4	171	163.5	50.0	231	220.9	67.5	291	278.3	85.0
52	49.7	15.2	12	107.1	32.7	72	164.5	50.3	32	221.8	67.8	92	279.2	85.3
53	50.7	15.5	13	108.1	33.0	73	165.4	50.6	33	222.8	68.1	93	280.2	85.5
54	51.6	15.8	14	109.0	33.3	74	166.4	50.9	34	223.8	68.4	94	281.1	85.8
55	52.6	16.1	15	110 0	33.6	75	167.3	51 2	35	224.7	68.7	95	282.1	86.1
56	53.5	16.4	16	110.9	33.9	76	168.3	51.4	36	225.7	69.0	96	283.0	86.4
57	54.5	16.7	17	111.9	34.2	77	169.3	51.7	37	226.6	69.3	97	284.0	86.7
58	55.5	17.0	18	112.8	34.5	78	170.2	52.0	38	227.6	69.6	98	285.0	87.0
59	56.4	17.2	19	113.8	34.8	79	171.2	52.3	39	228.5	69.9	99	285.9	87.3
60	57.4	17.5	120	114.7	35.1	180	172.1	52.6	240	229.5	70.2	300	286.9	87.6
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 18 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	01.0	00.3	61	58.0	18.8	121	115.1	37.4	181	172.1	55.9	241	229.2	74.5
2	01.9	00.6	62	59.0	19.2	22	116.0	37.7	82	173.1	56.2	42	230.1	74.8
3	02.9	00.9	63	59.9	19.5	23	117.0	38.0	83	174.0	56.5	43	231.1	75.1
4	03.8	01.2	64	60.9	19.8	24	117.9	38.3	84	175.0	56.9	44	232.0	75.4
5	04.8	01.5	65	61.8	20.1	25	118.9	38.6	85	175.9	57.2	45	233.0	75.7
6	05.7	01.9	66	62.8	20.4	26	119.8	38.9	86	176.9	57.5	46	233.9	76.0
7	06.7	02.2	67	63.7	20.7	27	120.8	39.2	87	177.8	57.8	47	234.9	76.3
8	07.6	02.5	68	64.7	21.0	28	121.7	39.6	88	178.8	58.1	48	235.8	76.6
9	08.6	02.8	69	65.6	21.3	29	122.7	39.9	89	179.7	58.4	49	236.8	76.9
10	09.5	03.1	70	66 6	21.6	30	123.6	40.2	90	180.7	58.7	50	237.8	77.3
11	10.5	03.4	71	67.5	21.9	131	124.6	40.5	191	181.6	59.0	251	238.7	77.6
12	11.4	03.7	72	68.5	22.2	32	125.5	40.8	92	182.6	59.3	52	239.7	77.9
13	12.4	04.0	73	69.4	22.6	33	126.5	41.1	93	183.5	59.6	53	240.6	78.2
14	13.3	04.3	74	70.4	22.9	34	127.4	41.4	94	184.5	59.9	54	241.6	78.5
15	14.3	04.6	75	71.3	23.2	35	128.4	41.7	95	185.4	60.3	55	242.5	78.8
16	15.2	04.9	76	72.3	23.5	36	129.3	42.0	96	186.4	60.6	56	243.5	79.1
17	16.2	05.3	77	73.2	23.8	37	130.3	42.3	97	187.3	60.9	57	244.4	79.4
18	17.1	05 6	78	74.2	24.1	38	131.2	42.6	98	188.3	61.2	58	245.4	79.7
19	18.1	05.9	79	75.1	24.4	39	132.2	43.0	99	189.2	61.5	59	246.3	80.0
20	19.0	06.2	80	76.1	24.7	40	133.1	43.3	200	190.2	61.8	60	247.3	80.3
21	20.0	06.5	81	77.0	25.0	141	134.1	43.6	201	191.2	62.1	261	248.2	80.6
22	20.9	06.8	82	78.0	25.3	42	135.0	43.9	02	192.1	62.4	62	249.2	81.0
23	21.9	07.1	83	78.9	25.6	43	136.0	44.2	03	193.1	62.7	63	250.1	81.3
24	22.8	07.4	84	79.9	26.0	44	136.9	44.5	04	194.0	63.0	64	251.1	81.6
25	23.8	07.7	85	80.8	26.3	45	137.9	44.8	05	195.0	63.3	65	252.0	81.9
26	24.7	08.0	86	81.8	26.6	46	138.8	45.1	06	195.9	63.7	66	253.0	82.2
27	25.7	08.3	87	82.7	26.9	47	139.8	45.4	07	196.9	64.0	67	253.9	82.5
28	26.6	08.7	88	83.7	27.2	48	140.7	45.7	08	197.8	64.3	68	254.9	82.8
29	27.6	09.0	89	84.6	27.5	49	141.7	46.0	09	198.8	64.6	69	255.8	83.1
30	28.5	09.3	90	85.6	27.8	50	142.7	46.3	10	199.7	64.9	70	256.8	83.4
31	29.5	09.6	91	86.5	28.1	151	143.6	46.7	211	200.7	65.2	271	257.7	83.7
32	30.4	09.9	92	87.5	28.4	52	144.6	47.0	12	201.6	65.5	72	258.7	84.0
33	31.4	10.2	93	88.4	28.7	53	145.5	47.3	13	202.6	65.8	73	259.6	84.4
34	32.3	10.5	94	89.4	29.0	54	146.5	47.6	14	203.5	66.1	74	260.6	84.7
35	33.3	10.8	95	90.3	29.4	55	147.4	47.9	15	204.5	66.4	75	261.5	85.0
36	34.2	11.1	96	91.3	29.7	56	148.4	48.2	16	205.4	66.7	76	262.5	85.3
37	35.2	11.4	97	92.2	30.0	57	149.3	48.5	17	206.4	67.1	77	263.4	85.6
38	36.1	11.7	98	93.2	30.3	58	150.3	48.8	18	207.3	67.4	78	264.4	85.9
39	37.1	12.1	99	94.1	30.6	59	151.2	49.1	19	208.3	67.7	79	265.3	86.2
40	38.0	12.4	100	95.1	30.9	60	152.2	49.4	20	209.2	68.0	80	266.3	86.5
41	39.0	12.7	101	96.1	31.2	161	153.1	49.7	221	210.2	68.3	281	267.2	86.8
42	39.9	13.0	02	97.0	31.5	62	154.1	50.1	22	211.1	68.6	82	268.2	87.1
43	40.9	13.3	03	98.0	31.8	63	155.0	50.4	23	212.1	68.9	83	269.1	87.4
44	41.8	13.6	04	98.9	32 1	64	156.0	50.7	24	213.0	69.2	84	270.1	87.8
45	42.8	13.9	05	99.9	32.4	65	156.9	51.0	25	214.0	69.5	85	271.0	88.1
46	43.7	14.2	06	100.8	32.8	66	157.9	51.3	26	214.9	69.8	86	272.0	88.4
47	44.7	14.5	07	101.8	33.1	67	158.8	51.6	27	215.9	70.1	87	272.9	88.7
48	45.6	14.8	08	102.7	33.4	68	159.8	51.9	28	216.8	70.5	88	273.9	89.0
49	46.6	15.1	09	103.7	33.7	69	160.7	52.2	29	217.8	70.8	89	274.8	89.3
50	47.6	15.5	10	104.6	34.0	70	161.7	52.5	30	218.7	71.1	90	275.8	89.6
51	48.5	15.8	111	105.6	34.3	171	162.6	52.8	231	219.7	71.4	291	276.7	89.9
52	49.5	16.1	12	106.5	34.6	72	163.6	53.1	32	220.6	71.7	92	277.7	90.2
53	50.4	16.4	13	107.5	34.9	73	164.5	53.5	33	221.6	72.0	93	278.6	90.5
54	51.4	16.7	14	108.4	35.2	74	165.5	53.8	34	222.5	72.3	94	279.6	90.8
55	52.3	17.0	15	109.4	35.5	75	166.4	54.1	35	223.5	72.6	95	280.5	91.2
56	53.3	17.3	16	110.3	35.8	76	167.4	54.4	36	224.4	72.9	96	281.5	91.5
57	54.2	17.6	17	111.3	36 2	77	168.3	54.7	37	225.4	73.2	97	282.4	91.8
58	55.2	17.9	18	112.2	36.5	78	169.3	55.0	38	226.3	73.5	98	283.4	92.1
59	56.1	18.2	19	113.2	36.8	79	170.2	55.3	39	227.3	73.9	99	284.3	92.4
60	57.1	18.5	120	114.1	37.1	180	171.2	55.6	240	228.2	74.2	300	285.3	92.7
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 72 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep
1	00.9	00.3	61	57.7	19.9	121	114.4	39.4	181	171.1	58.9	241	227.9	78.5
2	01.9	00.7	62	58.6	20.2	22	115.3	39 7	82	172.1	59.3	42	228.8	78.8
3	02.8	01.0	63	59.6	20.5	23	116.3	40.0	83	173.0	59.6	43	229.7	79.1
4	03.8	01.3	64	60.5	20.8	24	117.2	40.4	84	174.0	59.9	44	230.7	79.4
5	04.7	01.6	65	61.5	21.2	25	118.2	40.7	85	174.9	60.2	45	231.6	79.8
6	05.7	02.0	66	62.4	21.5	26	119.1	41.0	86	175.9	60.6	46	232.6	80.1
7	06.6	02.3	67	63.3	21.8	27	120.1	41.4	87	176.8	60.9	47	233.5	80.4
8	07.6	02.6	68	64.3	22.1	28	121.0	41.7	88	177.7	61.2	48	234.5	80.7
9	08.5	02.9	69	65.2	22.5	29	122.0	42.0	89	178.7	61.5	49	235.4	81.1
10	09.5	03.3	70	66.2	22.8	30	122.9	42.3	90	179.6	61.9	50	236.4	81.4
11	10.4	03.6	71	67.1	23.1	131	123.9	42.7	191	180.6	62.2	251	237.3	81.7
12	11.3	03.9	72	68.1	23.4	32	124.8	43.0	92	181.5	62.5	52	238.3	82.1
13	12.3	04.2	73	69.0	23.8	33	125.7	43.3	93	182.5	62.8	53	239.2	82.4
14	13.2	04.6	74	70.0	24.1	34	126.7	43.6	94	183.4	63.2	54	240.1	82.7
15	14.2	04.9	75	70.9	24.4	35	127.6	44.0	95	184.4	63.5	55	241.1	83.0
16	15.1	05.2	76	71.9	24.7	36	128.6	44.3	96	185.3	63.8	56	242.0	83.4
17	16.1	05.5	77	72.8	25.1	37	129.5	44.6	97	186.3	64.1	57	243.0	83.7
18	17.0	05.9	78	73.7	25.4	38	130.5	44.9	98	187.2	64.5	58	243.9	84.0
19	18.0	06.2	79	74.7	25.7	39	131.4	45.3	99	188.1	64 8	59	244.9	84.3
20	18.9	06.5	80	75.6	26.0	40	132.4	45 6	200	189.1	65.1	60	245.8	84.7
21	19.9	06.8	81	76.6	26.4	141	133.3	45.9	201	190.0	65 4	261	246.8	85.0
22	20 8	07.2	82	77.5	26.7	42	134.3	46.2	02	191.0	65.8	62	247.7	85.3
23	21.7	07.5	83	78.5	27.0	43	135.2	46.6	03	191.9	66.1	63	248.7	85.6
24	22.7	07.8	84	79.4	27.4	44	136.1	46.9	04	192.9	66.4	64	249.6	86.0
25	23.6	08.1	85	80.4	27.7	45	137.1	47.2	05	193.8	66.7	65	250.5	86.3
26	24.6	08.5	86	81.3	28.0	46	138.0	47.5	06	194.8	67.1	66	251.5	86.6
27	25.5	08.8	87	82.3	28.3	47	139.0	47.9	07	195.7	67 4	67	252.4	86.9
28	26.5	09 1	88	83.2	28.7	48	139.9	48.2	08	196.7	67.7	68	253.4	87.3
29	27 4	09.4	89	84.1	29.0	49	140.9	48.5	09	197.6	68.1	69	254.3	87.6
30	28.4	09.8	90	85.1	29.3	50	141.8	48.8	10	198.5	68.4	70	255.3	87.9
31	29.3	10.1	91	86.0	29.6	151	142.8	49.2	211	199.5	68.7	271	256.2	88.2
32	30.3	10.4	92	87.0	30.0	52	143.7	49.5	12	200.4	69.0	72	257.2	88.6
33	31.2	10.7	93	87.9	30.3	53	144.7	49.8	13	201.4	69.4	73	258.1	88.9
34	32.1	11.1	94	88.9	30.6	54	145.6	50.1	14	202.3	69.7	74	259.1	89.2
35	33.1	11.4	95	89.8	30.9	55	146.6	50.5	15	203.3	70.0	75	260.0	89 5
36	34 0	11.7	96	90.8	31 3	56	147.5	50.8	16	204.2	70.3	76	260.9	89.9
37	35.0	12.0	97	91.7	31.6	57	148.4	51.1	17	205.2	70.7	77	261.9	90.2
38	35.9	12.4	98	92 7	31.9	58	149.4	51.4	18	206.1	71.0	78	262.8	90.5
39	36.9	12.7	99	93.6	32.2	59	150.3	51.8	19	207.1	71.3	79	263.8	90.8
40	37.8	13.0	100	94.5	32.6	60	151.3	52.1	20	208.0	71.6	80	264.7	91.2
41	38.8	13.3	101	95.5	32.9	161	152.2	52.4	221	208.9	72.0	281	265.7	91.5
42	39.7	13.7	02	96.4	33.2	62	153.2	52.7	22	209.9	72.3	82	266.6	91.8
43	40.7	14.0	03	97.4	33.5	63	154.1	53.1	23	210.8	72.6	83	267.6	92.1
44	41.6	14.3	04	98.3	33.9	64	155.1	53.4	24	211.8	72.9	84	268.5	92.5
45	42.5	14.7	05	99.3	34.2	65	156.0	53.7	25	212.7	73.3	85	269.5	92.8
46	43.5	15.0	06	100.2	34.5	66	156.9	54.0	26	213.7	73.6	86	270.4	93.1
47	44.4	15.3	07	101.2	34.8	67	157.9	54.4	27	214.6	73.9	87	271.3	93.4
48	45.4	15.6	08	102.1	35.2	68	158.8	54.7	28	215.6	74.2	88	272.3	93.8
49	46.3	16.0	09	103.1	35.5	69	159.8	55.0	29	216.5	74.6	89	273.2	94.1
50	47.3	16.3	10	104.0	35.8	70	160.7	55.4	30	217.5	74.9	90	274.2	94.4
51	48.2	16.6	111	104.9	36.1	171	161.7	55.7	231	218.4	75.2	291	275.1	94.7
52	49.2	16.9	12	105.9	36.5	72	162.6	56.0	32	219.3	75.5	92	276.1	95.1
53	50.1	17.3	13	106.8	36.8	73	163.6	56.3	33	220.3	75.9	93	277.0	95.4
54	51.1	17.6	14	107.8	37.1	74	164.5	56.7	34	221.2	76.2	94	278.0	95.7
55	52.0	17.9	15	108.7	37.4	75	165.5	57.0	35	222.2	76.5	95	278 9	96.1
56	52.9	18.2	16	109.7	37.8	76	166.4	57.3	36	223.1	76.8	96	279.9	96.4
57	53.9	18.6	17	110.6	38.1	77	167.3	57.6	37	224.1	77.2	97	280.8	96.7
58	54.8	18.9	18	111.6	38.4	78	168.3	58.0	38	225.0	77.5	98	281.7	97.0
59	55.8	19.2	19	112.5	38.7	79	169.3	58.3	39	226.0	77.8	99	282.7	97.4
60	56.7	19.5	120	113.5	39.1	180	170.2	58.6	240	226.9	78.1	300	283.6	97.7
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 20 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.3	61	57.3	20.9	121	113.7	41.4	181	170.1	61.9	241	226.5	82.4
2	01.9	00.7	62	58.3	21.2	22	114.6	41.7	82	171.0	62.2	42	227.4	82.8
3	02.8	01.0	63	59.2	21.5	23	115.6	42.1	83	172.0	62.6	43	228.3	83.1
4	03.8	01.4	64	60.1	21.9	24	116.5	42.4	84	172.9	62.9	44	229.3	83.4
5	04.7	01.7	65	61.1	22.2	25	117.5	42.8	85	173.8	63.3	45	230.2	83.8
6	05.6	02.1	66	62 0	22.6	26	118.4	43.1	86	174.8	63.6	46	231.2	84.1
7	06.6	02.4	67	63.0	22.9	27	119.3	43.4	87	175.7	64.0	47	232.1	84.5
8	07.5	02.7	68	63.9	23.3	28	120.3	43.8	88	176.7	64.3	48	233.0	84.8
9	08.5	03.1	69	64.8	23.6	29	121.2	44.1	89	177.6	64.6	49	234.0	85.2
10	09.4	03.4	70	65.8	23.9	30	122.2	44.5	90	178.5	65.0	50	234.9	85.5
11	10.3	03.8	71	66.7	24.3	131	123.1	44.8	191	179.5	65.3	251	235.9	85.8
12	11.3	04.1	72	67.7	24.6	32	124.0	45.1	92	180.4	65.7	52	236.8	86.2
13	12.2	04 4	73	68.6	25.0	33	125.0	45.5	93	181.4	66.0	53	237.7	86.5
14	13.2	04.8	74	69.5	25.3	34	125.9	45.8	49	182.3	66.3	54	238.7	86 9
15	14.1	05.1	75	70.5	25.7	35	126.9	46.2	95	183.2	66.7	55	239.6	87.2
16	15.0	05.5	76	71.4	26.0	36	127.8	46.5	96	184.2	67.0	56	240.6	87.6
17	16 0	05.8	77	72.4	26.3	37	128.7	46.9	97	185.1	67.4	57	241.5	87.9
18	16.9	06.2	78	73.3	26.7	38	129.7	47.2	98	186.1	67.7	58	242.4	88.2
19	17.9	06.5	79	74.2	27.0	39	130.6	47.5	99	187.0	68.1	59	243.4	88.6
20	18.8	06.8	80	75.2	27.4	40	131.6	47.9	200	187.9	68.4	60	244.3	88.9
21	19.7	07.2	81	76.1	27.7	141	132.5	48.2	201	188.9	68.7	261	245.3	89.3
22	20.7	07.5	82	77.1	28.0	42	133.4	48.6	02	189.8	69.1	62	246.2	89.6
23	21.6	07.9	83	78.0	28.4	43	134.4	48.9	03	190.8	69.4	63	247.1	89.9
24	22.6	08.2	84	78.9	28.7	44	135.3	49.2	04	191.7	69.8	64	248.1	90.3
25	23.5	08.6	85	79.9	29.1	45	136.3	49.6	05	192.6	70.1	65	249.0	90.6
26	24.4	08.9	86	80.8	29.4	46	137.2	49.9	06	193.6	70.5	66	250.0	91.0
27	25.4	09.2	87	81.8	29.8	47	138.1	50.3	07	194.5	70.8	67	250.9	91.3
28	26.3	09.6	88	82.7	30.1	48	139.1	50.6	08	195.5	71.1	68	251.8	91.7
29	27.3	09.9	89	83.6	30.4	49	140.0	51.0	09	196.4	71.5	69	252.8	92.0
30	28.2	10.3	90	84.6	30.8	50	141.0	51 3	10	197.3	71.8	70	253.7	92.3
31	29.1	10.6	91	85.5	31.1	151	141.9	51.6	211	198.3	72.2	271	254 7	92.7
32	30.1	10.9	92	86.5	31.5	52	142.8	52.0	12	199.2	72.5	72	255.6	93.0
33	31.0	11.3	93	87.4	31.8	53	143.8	52.3	13	200.2	72.8	73	256.5	93.4
34	31 9	11.6	94	88.3	32.1	54	144.7	52.7	14	201.1	73.2	74	257.5	93.7
35	32.9	12.0	95	89.3	32.5	55	145.7	53.0	15	202.0	73.5	75	258.4	94.1
36	33.8	12.3	96	90.2	32.8	56	146.6	53.4	16	203.0	73.9	76	259.4	94.4
37	34.8	12.7	97	91.2	33.2	57	147.5	53.7	17	203.9	74 2	77	260.3	94.7
38	35.7	13.0	98	92.1	33.5	58	148.5	54.0	18	204.9	74.6	78	261.2	95.1
39	36.6	13.3	99	93.0	33.9	59	149.4	54 4	19	205.8	74.9	79	262.2	95.4
40	37.6	13.7	100	94.0	34.2	60	150.4	54.7	20	206.7	75.2	80	263.1	95.8
41	38.5	14.0	101	94.9	34.5	161	151.3	55.1	221	207.7	75.6	281	264.1	96.1
42	39.5	14.4	02	95.8	34.9	62	152.2	55.4	22	208.6	75.9	82	265.0	96.4
43	40.4	14.7	03	96.8	35.2	63	153.2	55.7	23	209.6	76.3	83	265.9	96.8
44	41.3	15.0	04	97.7	35.6	64	154.1	56.1	24	210.5	76.6	84	266.9	97.1
45	42.3	15.4	05	98.7	35 9	65	155.1	56.4	25	211.4	77.0	85	267.8	97.5
46	43.2	15.7	06	99.6	36.3	66	156.0	56.8	26	212.4	77.3	86	268.8	97.8
47	44.2	16 1	07	100.5	36.6	67	156.9	57.1	27	213.3	77.6	87	269.7	98.2
48	45.1	16.4	08	101.5	36.9	68	157.9	57.5	28	214.3	78.0	88	270.6	98.5
49	46.0	16.8	09	102.4	37.3	69	158.8	57.8	29	215.2	78.3	89	271.6	98.8
50	47.0	17.1	10	103.4	37.6	70	159.7	58.1	30	216.1	78.7	90	272.5	99.2
51	47.9	17.4	111	104.3	38.0	171	160.7	58.5	231	217.1	79.0	291	273.5	99.5
52	48.9	17.8	12	105.2	38.3	72	161.6	58.8	32	218.0	79.3	92	274.4	99.9
53	49.8	18.1	13	106.2	38.6	73	162.6	59.2	33	219.0	79.7	93	275.3	100.2
54	50.7	18.5	14	107.1	39.0	74	163.5	59.5	34	219.9	80.0	94	276.3	100.5
55	51.7	18.8	15	108.1	39.3	75	164.4	59.9	35	220.8	80.4	95	277.2	100 9
56	52.6	19.2	16	109.0	39.7	76	165.4	60.2	36	221.8	80.7	96	278.2	101.2
57	53.6	19.5	17	109.9	40.0	77	166.3	60.5	37	222.7	81.1	97	279.1	101.6
58	54.5	19.8	18	110.9	40 4	78	167.3	60.9	38	223.6	81.4	98	280 0	101.9
59	55.4	20.2	19	111.8	40.7	79	168 2	61.2	39	224.6	81.7	99	281.0	102.3
60	56.4	20.5	120	112.8	41.0	180	169.1	61.6	240	225.5	82.1	300	281.9	102.6
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 70 Degrees.

TABLE III. Difference of Latitude and Departure for 21 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.4	61	56.9	21.9	121	113.0	43.4	181	169.0	64.9	241	225.0	86.4
2	01.9	00.7	62	57.9	22.2	22	113.9	43.7	82	169.9	65.2	42	225.9	86.7
3	02.8	01.1	63	58.8	22.6	23	114.9	44.1	83	170.9	65.6	43	226.9	87.1
4	03.7	01.4	64	59.7	22.9	24	115.8	44.4	84	171.8	65.9	44	227.8	87.4
5	04.7	01.8	65	60.7	23.3	25	116.7	44.8	85	172.7	66.3	45	228.7	87.8
6	05.6	02.2	66	61.6	23.7	26	117.7	45.2	86	173.7	66.7	46	229.7	88.2
7	06.5	02.5	67	62.5	24.0	27	118.6	45.5	87	174.6	67.0	47	230.6	88.5
8	07.5	02.9	68	63.5	24.4	28	119.5	45.9	88	175.5	67.4	48	231.5	88.9
9	08.4	03.2	69	64.4	24.7	29	120.5	46.2	89	176.5	67.7	49	232.5	89.2
10	09.3	03.6	70	65.3	25.1	30	121.4	46.6	90	177.4	68.1	50	233.4	89.6
11	10.3	03.9	71	66.3	25.4	131	122.3	47.0	191	178.3	68.5	251	234.3	90.0
12	11.2	04.3	72	67.2	25.8	32	123.3	47.3	92	179.3	68.8	52	235.3	90.3
13	12.1	04.6	73	68.1	26.2	33	124.2	47.7	93	180.2	69.2	53	236.2	90.7
14	13.1	05.0	74	69.1	26.5	34	125.1	48.0	94	181.1	69.5	54	237.1	91.0
15	14.0	05.4	75	70.0	26.9	35	126.1	48.4	95	182.1	69.9	55	238.1	91.4
16	14.9	05.7	76	70.9	27.2	36	127.0	48.7	96	183.0	70.2	56	239.0	91.8
17	15.9	06.1	77	71.9	27.6	37	127.9	49.1	97	183.9	70.6	57	239.9	92.1
18	16.8	06.5	78	72.8	28.0	38	128.9	49.5	98	184.9	71.0	58	240.9	91.5
19	17.7	06.8	79	73.7	28.3	39	129.8	49.8	99	185.8	71.3	59	241.8	92.8
20	18.7	07.2	80	74.7	28.7	40	130.7	50.2	200	186.7	71.7	60	242.7	93.2
21	19.6	07.5	81	75.6	29.0	141	131.7	50.5	201	187.6	72.0	261	243.7	93.5
22	20.5	07.9	82	76.5	29.4	42	132.6	50.9	02	188.6	72.4	62	244.6	93.9
23	21.5	08.2	83	77.5	29.7	43	133.5	51.3	03	189.5	72.8	63	245.5	94.3
24	22.4	08.6	84	78.4	30.1	44	134.5	51.6	04	190.4	73.1	64	246.5	94.6
25	23.3	09.0	85	79.3	30.5	45	135.4	52.0	05	191.4	73.5	65	247.4	95.0
26	24.3	09.3	86	80.3	30.8	46	136.3	52.3	06	192.3	73.8	66	248.3	95.3
27	25.2	09.7	87	81.2	31.2	47	137.3	52.7	07	193.2	74.2	67	249.3	95.7
28	26.1	10.0	88	82.1	31.5	48	138.2	53.0	08	194.2	74.5	68	250.2	96.1
29	27.1	10.4	89	83.1	31.9	49	139.1	53.4	09	195.1	74.9	69	251.1	96.4
30	28.0	10.8	90	84.0	32.3	50	140.1	53.8	10	196.0	75.3	70	252.1	96.8
31	28.9	11.1	91	84.9	32.6	151	141.0	54.1	211	197.0	75.6	271	253.0	97.1
32	29.9	11.5	92	85.9	33.0	52	141.9	54.5	12	197.9	76.0	72	253.9	97.5
33	30.8	11.8	93	86.8	33.3	53	142.9	54.8	13	198.8	76.3	73	254.9	97.8
34	31.7	12.2	94	87.7	33.7	54	143.8	55.2	14	199.8	76.7	74	255.8	98.2
35	32.7	12.5	95	88.7	34.0	55	144.7	55.6	15	200.7	77.1	75	256.7	98.6
36	33.6	12.9	96	89.6	34.4	56	145.7	55.9	16	201.6	77.4	76	257.7	98.9
37	34.5	13.3	97	90.5	34.8	57	146.6	56.3	17	202.6	77.8	77	258.6	99.3
38	35.5	13.6	98	91.5	35.1	58	147.5	56.6	18	203.5	78.1	78	259.5	99.6
39	36.4	14.0	99	92.4	35.5	59	148.5	57.0	19	204.4	78.5	79	260.5	100.0
40	37.3	14.3	100	93.4	35.8	60	149.4	57.3	20	205.4	78.8	80	261.4	100.4
41	38.3	14.7	101	94.3	36.2	161	150.3	57.7	221	206.3	79.2	281	262.3	100.9
42	39.2	15.1	02	95.3	36.6	62	151.3	58.1	22	207.2	79.6	82	263.3	101.1
43	40.1	15.4	03	96.2	36.9	63	152.2	58.4	23	208.2	79.9	83	264.2	101.4
44	41.1	15.8	04	97.1	37.3	64	153.1	58.8	24	209.1	80.3	84	265.1	101.8
45	42.0	16.1	05	98.1	37.6	65	154.1	59.1	25	210.0	80.6	85	266.1	102.1
46	42.9	16.5	06	99.0	38.0	66	155.0	59.5	26	211.0	81.0	86	267.0	102.5
47	43.9	16.8	07	99.9	38.3	67	155.9	59.9	27	211.9	81.4	87	267.9	102.9
48	44.8	17.2	08	100.9	38.7	68	156.9	60.2	28	212.8	81.7	88	268.9	103.2
49	45.7	17.6	09	101.8	39.1	69	157.8	60.6	29	213.8	82.1	89	269.8	103.6
50	46.7	17.9	10	102.7	39.4	70	158.7	60.9	30	214.7	82.4	90	270.7	103.9
51	47.6	18.3	111	103.7	39.8	171	159.7	61.3	231	215.6	82.8	291	271.7	104.3
52	48.5	18.6	12	104.6	40.1	72	160.6	61.6	32	216.6	83.1	92	272.6	104.7
53	49.5	19.0	13	105.5	40.5	73	161.5	62.0	33	217.5	83.5	93	273.5	105.0
54	50.4	19.4	14	106.5	40.9	74	162.5	62.4	34	218.4	83.9	94	274.5	105.4
55	51.3	19.7	15	107.4	41.2	75	163.4	62.7	35	219.4	84.2	95	275.4	105.7
56	52.3	20.1	16	108.3	41.6	76	164.3	63.1	36	220.3	84.6	96	276.3	106.1
57	53.2	20.4	17	109.3	41.9	77	165.3	63.4	37	221.2	84.9	97	277.3	106.4
58	54.1	20.8	18	110.2	42.3	78	166.2	63.8	38	222.2	85.3	98	278.2	106.8
59	55.1	21.1	19	111.1	42.6	79	167.1	64.2	39	223.1	85.7	99	279.1	107.2
60	56.0	21.5	120	112.1	43.0	180	168.1	64.5	240	224.1	86.0	300	280.1	107.5
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 69 Degrees.

TABLE III. Difference of Latitude and Departure for 22 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.4	61	56.6	22.9	121	112.2	45.3	181	167.8	67.8	241	223.5	90.3
2	01.9	00.7	62	57.5	23.2	22	113.1	45.7	82	168.8	68.2	42	224.4	90.7
3	02.8	01.1	63	58.4	23.6	23	114.0	46.1	83	169.7	68.6	43	225.3	91.0
4	03.7	01.5	64	59.3	24.0	24	115.0	46.5	84	170.6	68.9	44	226.2	91.4
5	04.6	01.9	65	60.3	24.3	25	115.9	46.8	85	171.5	69.3	45	227.2	91.8
6	05.6	02.2	66	61.2	24.7	26	116.8	47.2	86	172.5	69.7	46	228.1	92.2
7	06.5	02.6	67	62.1	25.1	27	117.8	47.6	87	173.4	70.1	47	229.0	92.5
8	07.4	03.0	68	63.0	25.5	28	118.7	47.9	88	174.3	70.4	48	229.9	92.9
9	08.3	03.4	69	64.0	25.8	29	119.6	48.3	89	175.2	70.8	49	230.9	93.3
10	09.3	03.7	70	64.9	26.2	30	120.5	48.7	90	176.2	71.2	50	231.8	93.7
11	10.2	04.1	71	65.8	26.6	131	121.5	49.1	191	177.1	71.5	251	232.7	94.0
12	11.1	04.5	72	66.8	27.0	32	122.4	49.4	92	178.0	71.9	52	233.7	94.4
13	12.1	04.9	73	67.7	27.3	33	123.3	49.8	93	178.9	72.3	53	234.6	94.8
14	13.0	05.2	74	68.6	27.7	3	124.2	50.2	94	179.8	72.7	54	235.5	95.2
15	13.9	05.6	75	69.5	28.1	35	125.2	50.6	95	180.8	73.0	55	236.4	95.5
16	14.9	06.0	76	70.5	28.5	36	126.1	50.9	96	181.7	73.4	56	237.4	95.9
17	15.8	06.4	77	71.4	28.8	37	127.0	51.3	97	182.7	73.8	57	238.3	96.3
18	16.7	06.7	78	72.3	29.2	38	128.0	51.7	98	183.6	74.2	58	239.2	96.6
19	17.6	07.1	79	73.2	29.6	39	128.9	51.1	99	184.5	74.5	59	240.1	97.0
20	18.5	07.5	80	74.2	30.0	40	129.8	52.4	200	185.4	74.9	60	241.1	97.4
21	19.5	07.9	81	75.1	30.3	141	130.7	52.8	201	186.4	75.3	261	242.0	97.8
22	20.4	08.2	82	76.0	30.7	42	131.7	53.2	02	187.3	75.7	62	242.9	98.1
23	21.3	08.6	83	77.0	31.1	43	132.6	53.6	03	188.2	76.0	63	243.0	98.5
24	22.3	09.0	84	77.9	31.5	44	133.5	53.9	04	189.1	76.4	64	244.8	98.9
25	23.2	09.4	85	78.8	31.8	45	134.4	54.3	05	190.1	76.8	65	245.7	99.3
26	24.2	09.7	86	79.7	32.2	46	135.4	54.7	06	191.0	77.2	66	246.6	99.6
27	25.0	10.1	87	80.7	32 6	47	136.3	55.1	07	191.9	77.5	67	247.6	100.0
28	26.0	10.5	88	81.6	33.0	48	137.2	55.4	08	192.9	77.9	68	248.5	100.4
29	26.9	10.9	89	82.5	33.3	49	138.2	55.8	09	193.8	78.3	69	249.4	100. 8
30	27.8	11.2	90	83.4	33.7	50	139.1	56.2	10	194.7	78.7	70	250.3	101.1
31	28.7	11.6	91	84.4	34.1	151	140.0	56.6	211	195.6	79.0	271	251.3	101.5
32	29.7	12.0	92	85.3	34.5	52	140.9	56.9	12	196.6	79.4	72	252.2	101.9
33	30.6	12.4	93	86.2	34.8	53	141.9	57.3	13	197.5	79.8	73	253.1	102.3
34	31.5	12.7	94	87.2	35.2	54	142.8	57.7	14	198.4	80.2	74	254.1	102.6
35	32.5	13.1	95	88.1	35.6	55	143.7	58.1	15	199.3	80.5	75	255.0	103.0
36	33.4	13.5	96	89.0	36.0	56	144.6	58.4	16	200.3	80.9	76	255.9	113.4
37	34.3	13.9	97	89.9	36.3	57	145.6	58.8	17	201.2	81.3	77	256.8	103.8
38	35.2	14.2	98	90.9	36.7	58	146.5	59.2	18	202.1	81.7	78	257.8	104.1
39	36.2	14.6	99	91.8	37.1	59	147.4	59.6	19	203.1	82.0	79	258.7	104.5
40	37.1	15.0	100	92.7	37.5	60	148.4	59.9	20	204.0	82.4	80	259.6	104.9
41	38.0	15.4	101	93.6	37.8	161	149.3	60.3	221	204.9	82.8	281	260.5	105.3
42	38.9	15.7	02	94.6	38.2	62	150.2	60.7	22	205.8	83.2	82	261.5	105.6
43	39.9	16.1	03	95.5	38.6	63	151.1	61.1	23	206.7	83.5	83	262.4	106.0
44	40.8	16.5	04	96.4	39.0	64	152.1	61.4	24	207.7	83.9	84	263.3	106.4
45	41.7	16.9	05	97.4	39.3	65	153.0	61.8	25	208.6	84.3	85	264.3	106.8
46	42.7	17.2	06	98.3	39.7	66	153.9	62.2	26	209.5	84.7	86	265.2	107.1
47	43.6	17.6	07	99.2	40.1	67	154.8	62.6	27	210.5	85.0	87	266.1	107.5
48	44.5	18.0	08	100.1	40.5	68	155.8	62.9	28	211.4	85.4	88	267.0	107.9
49	45.4	18.4	09	101.1	40.8	69	156.7	63.3	29	212.3	85.8	89	268.0	108.3
50	46.4	18.7	10	102.0	41.2	70	157.6	63.7	30	213.3	86.2	90	268.9	108.6
51	47.3	19.1	111	102.9	41.6	171	158.6	64.1	231	214.2	86.5	291	269.8	109.0
52	48.2	19.5	12	103.8	42.0	72	159.5	64.4	32	215.1	86.9	92	270.7	109.4
53	49.1	19.9	13	104.8	42.3	73	160.4	64.8	33	216.0	87.3	93	271.7	109.8
54	50.1	20.2	14	105.7	42.7	74	161.3	65.2	34	217.0	87.7	94	272.6	110.1
55	51.0	20.6	15	106.6	43.1	75	162.3	65.6	35	117.9	88.0	95	273.5	110.5
56	51.9	21.0	16	107.6	43.5	76	163.2	65.9	36	218.8	88.4	96	274.5	110.9
57	52.9	21.4	17	108.5	43.8	77	164.1	66.3	37	219.7	88.8	97	275.4	111.3
58	53.8	21.7	18	109.4	44.2	78	165.0	66.7	38	220.7	89.2	98	276.3	111.6
59	54.7	22.1	19	110.3	44.6	79	166.0	67.1	39	221.6	89.5	99	277.2	112.0
60	55.6	22.5	120	111.3	45.0	180	166.9	67.4	240	222.5	89.9	300	278.2	112.4
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 68 Degrees.

TABLE III. Difference of Latitude and Departure for 23 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.4	61	56.1	23.8	121	111.4	47.3	181	166.6	70.7	241	222.8	94.1
2	01.8	00.8	62	57.1	24.2	22	112.3	47.7	82	167.5	71.1	42	222.8	94.5
3	02.8	01.2	63	58.0	24.6	23	113.2	48.1	83	168.5	71.5	43	223.7	94.9
4	03.7	01.6	64	58.9	25.0	24	114.1	48.4	84	169.4	71.9	44	224.6	95.3
5	04.6	02.0	65	59.8	25.4	25	115.1	48.8	85	170.3	72.3	45	225.5	95.7
6	05.5	02.3	66	60.8	25.8	26	116.0	49.2	86	171 2	72.7	46	226.4	96.1
7	06.4	02.7	67	61.7	26.2	27	116.9	49.6	87	172.2	73.1	47	227.4	96.5
8	07.4	03.1	68	62.6	26.6	28	117.8	50.0	88	173.1	73.5	48	228.3	96.9
9	08.3	03.5	69	63.5	27.0	29	118.7	50.4	89	174.0	73.8	49	229.2	97.3
10	09.2	03.9	70	64.4	27.3	30	119.7	50.8	90	174.9	74.2	50	230.1	97 7
11	10.1	04.3	71	65.4	27.7	131	120.6	51.2	191	175 8	74.6	251	231.0	98.1
12	11.0	04.7	72	66.3	28.1	32	121.5	51.6	92	176.7	75.0	52	232.0	98.5
13	12.0	05.1	73	67.2	28.5	33	122.4	52.0	93	177.7	75.4	53	232.9	98.8
14	12.9	05.5	74	68.1	28.9	34	123.3	52.4	94	178.6	75.8	54	233.8	99.2
15	13.8	05.9	75	69.0	29.3	35	124.3	52.7	95	179.5	76.2	55	234 7	99.6
16	14.7	06.3	76	70.0	29.7	36	125.2	53.1	96	180.4	76.6	56	235.6	100.0
17	15.6	06.6	77	70.9	30.1	37	126.1	53.5	97	181.3	77.0	57	236.6	100.4
18	16.6	07.0	78	71.8	30.5	38	127.0	53.9	98	182.3	77.4	58	237.5	100.8
19	17.5	07.4	79	72.7	30.9	39	127.9	54.3	99	183.2	77.7	59	238.4	101.2
20	18.4	07.8	80	73.6	31.3	40	128.9	54.7	200	184.1	78.1	60	239.3	101.6
21	19.3	08.2	81	74.6	31.6	141	129.8	55.1	201	185.0	78.5	261	240.2	102.0
22	20.3	08.6	82	75.5	32.0	42	130.7	55.5	02	185.9	78.9	62	241.2	102.4
23	21.2	09.0	83	76.4	32.4	43	131.6	55.9	03	186.9	79.3	63	242.1	102.8
24	22.1	09.4	84	77.3	32.8	44	132.6	56.3	04	187.8	79.7	64	243.0	103.1
25	23.0	09.8	85	78.2	33.2	45	133.5	56.7	05	188.7	70.1	65	243.9	103.5
26	23.9	10.2	86	79.2	33.6	46	134.4	57.0	06	189.6	80.5	66	244.9	103.9
27	24.9	10.5	87	80.1	34.0	47	135.3	57.4	07	190.5	80.9	67	245.8	104.3
28	25.8	10.9	88	81.0	34.4	48	136.2	57.8	08	191.5	81.3	68	246.7	104.7
29	26.7	11.3	89	81.9	34.8	49	137.2	58.2	09	192.4	81.7	69	247.6	105.1
30	27.6	11.7	90	82.8	35.2	50	138.1	58.6	10	193.3	82.0	70	248.5	105.5
31	28.5	12.1	91	83.8	35.6	151	139.0	59.0	211	194.2	82.4	271	249.5	105.9
32	29.5	12.5	92	84.7	35.9	52	139.9	59.4	12	195.1	82.8	72	250.4	106.3
33	30.4	12.9	93	85.6	36.3	53	140.8	59.8	13	196.1	83.2	73	251.3	106.7
34	31.3	13.3	94	86.5	36.7	54	141.8	60.2	14	197.0	83.6	74	252.2	107.1
35	32.2	13.7	95	87.4	37.1	55	142.7	60.6	15	197.9	84.0	75	253.1	107.4
36	33.1	14.1	96	88.4	37.5	56	143.6	60.9	16	198.8	84.4	76	254.1	107.8
37	34.1	14.5	97	89.3	37.9	57	144 5	61.3	17	199.7	84.8	77	255.0	108.2
38	35.0	14.8	98	90.2	38.3	58	145.4	61.7	18	200.7	85.2	78	255.9	108.6
39	35.9	15.2	99	91.1	38.7	59	146.4	62.1	19	201.6	85.6	79	256.8	109.0
40	36.8	15.6	100	92.0	39.1	60	147.3	62.5	20	202.5	86.0	80	257.7	109.4
41	37.7	16.0	101	93.0	39.5	161	148.2	62.9	221	203.4	86.3	281	258.7	109.8
42	38.7	16.4	02	93.9	39.9	62	149.1	63.3	22	204.4	86.7	82	259.6	110.2
43	39.6	16.8	03	94.8	40.2	63	150.0	63.7	23	205.3	87.1	83	260.5	110.6
44	40.5	17.2	04	95.7	40.6	64	151.0	64.1	24	206.2	87.5	84	261.4	111.0
45	41.4	17.6	05	96.7	41.0	65	251.9	64.5	25	207.1	87.9	85	262.3	111.3
46	42.3	18.0	06	97.6	41.4	66	152.8	64.9	26	208.0	88.3	86	263.3	111.7
47	43.3	18.4	07	98.5	41.8	67	153.7	65.2	27	209.0	88.7	87	264.2	112.1
48	44.2	18.8	08	99.4	42.2	68	154.6	65.6	28	209.9	89.1	88	265.1	112.5
49	45.1	19.1	09	100.3	42.6	69	155.6	66 0	29	210.8	89.5	89	266.0	112.9
50	46.0	19.5	10	101.3	43.0	70	156.5	66.4	30	211.7	89.9	90	266.9	113.3
51	46.9	19.9	111	102.2	43.4	171	157.4	66.8	231	212 6	90.3	291	267.0	113.7
52	47.9	20.3	12	103.1	43.8	72	158.3	67.2	32	213.6	90.6	92	268.8	114.1
53	48.8	20.7	13	104.0	44.1	73	159.2	67.6	33	214.5	91.0	93	269.7	114.5
54	49.7	21.1	14	104.9	44.5	74	160.2	68.0	34	215.4	91.4	94	270.6	114.9
55	50.6	21.5	15	105.9	44.9	75	161.1	68.4	35	216.3	91.8	95	271.5	115.3
56	51.5	21.9	16	106.8	45.3	76	162.0	68.8	36	217.2	92.2	96	272.5	115.6
57	52.5	22.3	17	107.7	45.7	77	162.9	69.2	37	218.2	92.6	97	273.4	116.0
58	53.4	22.7	18	108.6	46.1	78	163.8	69.5	38	219.1	93.0	98	274.3	116.4
59	54.3	23.1	19	109.5	46.5	79	164.8	69.9	39	220.0	93.4	99	275.2	116.8
60	55.2	23.4	120	110.5	46.9	180	165.7	70.3	240	220.9	93.8	300	276.2	117.2
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 24 Degrees.

Dist	Lat.	Dep	Dist	La.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.4	61	55.7	24.8	121	110.5	49.2	181	165.3	73.6	241	220.2	98.0
2	01.8	00.8	62	56.6	25.2	22	111.4	49.6	82	166.3	74.0	42	221.1	98.4
3	02.7	01.2	63	57.6	25.6	23	112.4	50.0	83	167.2	74.4	43	222.0	98.8
4	03.7	01.6	64	58.5	26.0	24	113.3	50.4	84	168.1	74.8	44	222.9	99.2
5	04.6	02.0	65	59.4	26.4	25	114.2	50.8	85	169.0	75.2	45	223.8	99.6
6	05.5	02.4	66	60.3	26.8	26	115.1	51.2	86	169.9	75.6	46	224.7	100.0
7	06.4	02.8	67	61.2	27.2	27	116.0	51.7	87	170.8	76.1	47	225.6	100.5
8	07.3	03.3	68	62.1	27.7	28	116.9	52.1	88	171.7	76.5	48	226.5	100.9
9	08.2	03.7	69	63.0	28.1	29	117.8	52.5	89	172.7	76.9	49	227.5	101.3
10	09.1	04.1	70	63.9	28.5	30	118.8	52.9	90	173.6	77.3	50	228.4	101.7
11	10.0	04.5	71	64.9	28.9	131	119.7	53.3	191	174.5	77.7	251	229.3	102.1
12	11.0	04.9	72	65.8	29.3	32	120.6	53.7	92	175.4	78.1	52	230.2	102.5
13	11.9	05.3	73	66.7	29.7	33	121.5	54.1	93	176.3	78.5	53	231.1	102.9
14	12.8	05.7	74	67.6	30.1	34	122.4	54.5	94	177.2	78.9	54	232.0	103.3
15	13.7	06.1	75	68.5	30.5	35	123.3	54.9	95	178.1	79.3	55	232.9	103.7
16	14.6	06.5	76	69.4	30.9	36	124.2	55.3	96	179.0	79.7	56	233.9	104.1
17	15.5	06.9	77	70.3	31.3	37	125.1	55.7	97	180.0	80.1	57	234.8	104.5
18	16.4	07.3	78	71.3	31.7	38	126.1	56.1	98	180.9	80 5	58	235.7	104.9
19	17.4	07.7	79	72.2	32.1	39	127.0	56.5	99	181.8	80.9	59	236.6	105.3
20	18.3	08.1	80	73.1	32.5	40	127.9	56.9	200	182.7	81.3	60	237.5	105.7
21	19.2	08.5	81	74.0	32.9	141	128.8	57.3	201	183.6	81.7	261	238.4	106.1
22	20.1	08.9	82	74.9	33.3	42	129.7	57.8	02	184.5	82.2	62	239.3	106.6
23	21.0	09.4	83	75.8	33.8	43	130.6	58.2	03	185.4	82.6	63	240.3	107.0
24	21.9	09.8	84	76.7	34.2	44	131.5	58.6	04	186.4	83.0	64	241.2	107.4
25	22.8	10.2	85	77.6	34.6	45	132.5	59.0	05	187.3	83.4	65	242.1	107.8
26	23.8	10.6	86	78.6	35.0	46	133.4	59.4	06	188.2	83.8	66	243.0	108.2
27	24.7	11.0	87	79.5	35.4	47	134.3	59.8	07	189.1	84.2	67	243.9	108.6
28	25.6	11.4	88	80.4	35.8	48	135.2	60.2	08	190.0	84.6	68	244.8	109.0
29	26.5	11.8	89	81.3	36.2	49	136.1	60.6	09	190.9	85.0	69	245.7	109.4
30	27.4	12.2	90	82.2	36.6	50	137.0	61.0	10	191.8	85.4	70	246.6	109.8
31	28.3	12.6	91	83.1	37.0	151	137.9	61.4	211	192.7	85 8	271	247.6	110.2
32	29.2	13.0	92	84.0	37.4	52	138.9	61.8	12	193.7	86.2	72	248.5	110.6
33	30.1	13.4	93	85.0	37.8	53	139.8	62.2	13	194.6	86.6	73	249.4	111.0
34	31.1	13.8	94	85.9	38.2	54	140.7	62.6	14	195.5	87.0	74	250.3	111.4
35	32.0	14.2	95	86.8	38.6	55	141.6	63.0	15	196.4	87.4	75	251.2	111.8
36	32.9	14.6	96	87.7	39.0	56	142.5	63.4	16	197.3	87.8	76	252.1	112.2
37	33.8	15.0	97	88.6	39.4	57	143.4	63.9	17	198.2	88.3	77	253.0	112.7
38	34.7	15.5	98	89.5	39.9	58	144.3	64.3	18	199.1	88.7	78	254.0	113.1
39	35.6	15.9	99	90.4	40.3	59	145.2	64.7	19	200.1	89.1	79	254.9	113.5
40	36.5	16.3	100	91.4	40.7	60	146.2	65.1	20	201.0	89.5	80	255.8	113.9
41	37.5	16.7	101	92.3	41.1	161	147.1	65.5	221	201.9	89.9	281	256.7	114.3
42	38.4	17.1	02	93.2	41.5	62	148.0	65.9	22	202.8	90.3	82	257.6	114.7
43	39.3	17.5	03	94.1	41.9	63	148.9	66.3	23	203.7	90.7	83	258.5	115.1
44	40.2	17.9	04	95.0	42.3	64	149.8	66.7	24	204.6	91.1	84	259.4	115.5
45	41.1	18.3	05	95.9	42.7	65	150.7	67.1	25	205.5	91.5	85	260.3	115.9
46	42.0	18.7	06	96.8	43.1	66	151.6	67.5	26	206.5	91.9	86	261.3	116.3
47	42.9	19.1	07	97.7	43.5	67	152.6	67.9	27	207.4	92.3	87	262.2	116.7
48	43.8	19.5	08	98.7	43.9	68	153.5	68.3	28	208.3	92.7	88	263.1	117.1
49	44.8	19.9	09	99.6	44.3	69	154.4	68.7	29	209.2	93.1	89	264.0	117.5
50	45.7	20.3	10	100.5	44.7	70	155.3	69.1	30	210.1	93.5	90	264.9	117.9
51	46.6	20.7	111	101.4	45.1	171	156.2	69.5	231	211.0	93.9	291	265.8	118.3
52	47.5	21.1	12	102.3	45.6	72	157.1	70.0	32	211.9	94.4	92	266.7	118.8
53	48.4	21.6	13	103.2	46.0	73	158.0	70.4	33	212 8	04.8	93	267.7	119.2
54	49.3	22.0	14	104.1	46.4	74	158.9	70.8	34	213.8	95.2	94	268.6	119.6
55	50.2	22.4	15	105.1	46.8	75	159.9	71.2	35	214 7	95.6	95	269.5	120.0
56	51.0	22.8	16	106.0	47.2	76	160.8	71.6	36	215 6	96.0	96	270.4	120.4
57	52.1	23.2	17	106.9	47.6	77	161.7	72.0	37	216.5	96.4	97	271.3	120.8
58	53.0	23.6	18	107.8	48.0	78	162.6	72.4	38	217.4	96.8	98	272.2	121.2
59	53.9	24.0	19	108.7	48.4	79	163.5	72.8	39	218.3	97.2	99	273.1	121.6
60	54.8	24.4	120	109.6	48.8	180	164.4	73.2	240	219.2	97.6	300	274.1	212.0
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 66 Degrees.

Diff	Lat.	Dep	Diff	Lat.	Dep	Diff	Lat.	Dep	Diff	Lat.	Dep.	Diff	Lat.	Dep.
1	00.9	00.4	61	55.3	25.8	121	109.7	51.1	181	164.0	76.5	241	218.4	101.8
2	01.8	00.8	62	56.2	26.2	22	110.6	51.6	82	164.9	76.9	42	219.3	102.3
3	02.7	01.3	63	57.1	26.6	23	111.5	52.0	83	165.9	77.3	43	220.2	102.7
4	03.6	01.7	64	58.0	27.0	24	112.4	52.4	84	166.8	77.8	44	221.1	103.1
5	04.5	02.1	65	58.9	27.5	25	113.3	52.8	85	167.7	78.2	45	222.0	103.5
6	05.4	02.5	66	59.8	27.9	26	114.2	53.2	86	168.6	78.6	46	222.9	104.0
7	06.3	03.0	67	60.7	28.3	27	115.1	53.7	87	169.5	79.0	47	223.0	104.4
8	07.3	03.4	68	61.6	28.7	28	116.0	54.1	88	170.4	79.4	48	224.8	104.8
9	08.2	03.8	69	62.5	29.2	29	116.9	54.5	89	171.3	79.9	49	225.7	105.2
10	09.1	04.2	70	63.4	29.6	30	117.8	54.9	90	172.2	80.3	50	226.6	105.7
11	10.0	04.6	71	64.3	30.0	131	118.7	55.4	191	173.1	80.7	251	227.5	106.1
12	10.9	05.0	72	65.3	30.4	32	119.6	55.8	92	174.0	81.1	52	228.4	106.5
13	11.8	05.5	73	66.2	30.8	33	120.5	56.2	93	174.9	81.6	53	229.3	106.9
14	12.7	05.9	74	67.1	31.3	34	121.4	56.6	94	175.8	82.0	54	230.2	107.3
15	13.6	06.3	75	68.0	31.7	35	122.4	57.1	95	176.7	82.4	55	231.1	107.8
16	14.5	06.8	76	68.9	32.1	36	123.3	57.5	96	177.6	82.8	56	232.0	108.2
17	15.4	07.2	77	69.8	32.5	37	124.2	57.9	97	178.5	83.3	57	232.9	108.6
18	16.3	07.6	78	70.7	33.0	38	125.1	58.3	98	179.4	83.7	58	233.8	109.0
19	17.2	08.0	79	71.6	33.4	39	126.0	58.7	99	180.4	84.1	59	234.7	109.5
20	18.1	08.5	80	72.5	33.8	40	126.9	59.2	200	181.3	84.5	60	235.6	109.9
21	19.0	08.9	81	73.4	34.2	141	127.8	59.6	201	182.2	84 9	261	236.5	110.3
22	19.9	09.3	82	74.3	34.7	42	128.7	60.0	02	183.1	85.4	62	237.5	110.7
23	20.8	09.7	83	75.2	35.1	43	129.6	60.4	03	184.0	85.8	63	238.4	111.1
24	21.8	10.1	84	76.1	35.5	44	130.5	60.9	04	184.9	86.2	64	239.3	111.6
25	22.7	10.6	85	77.0	35.9	45	131.4	61.3	05	185.8	86.6	65	240.2	112.0
26	23.6	11.0	86	77.9	36.3	46	132.3	61.7	06	186.7	87.1	66	241.1	112.4
27	24.5	11.4	87	78.8	36.8	47	133.2	62.1	07	187.6	87.5	67	242.0	112.8
28	25.4	11.8	88	79.8	37.2	48	134.1	62.5	08	188.5	87.9	68	242.9	113.3
29	26.3	12.3	89	80.7	37.6	49	135.0	63.0	09	189.4	88.3	69	243.8	113.7
30	27.2	12.7	90	81.6	38 0	50	135.9	63.4	10	190.3	88.7	70	244.7	114.1
31	28.1	13.1	91	82.5	38.5	151	136.9	63.8	211	191.2	89.2	271	245.6	114.5
32	29.0	13.5	92	83.4	38.9	52	137.8	64.2	12	192 1	89.6	72	246.5	114.9
33	29.9	13.9	93	84.3	39.3	53	138.7	64.7	13	193.0	90.0	73	247.4	115.4
34	30.8	14.4	94	85.2	39.7	54	139.6	65.1	14	193.9	90.4	74	248.3	115.8
35	31.7	14.8	95	86.1	40.1	55	140.5	65.5	15	194.9	90.9	75	249.2	116.2
36	32.6	15.2	96	87.0	40.6	56	141.4	65.9	16	195.8	91.3	76	250.1	116.6
37	33.5	15.6	97	87.9	41.0	57	142.3	66.3	17	196.7	91.7	77	251.0	117.1
38	34.4	16.1	98	88.8	41.4	58	143.2	66.8	18	197 6	92.1	78	252.0	117.5
39	35.3	16.5	99	89.7	41.8	59	144.1	67.2	19	198.5	92 5	79	252.9	117.9
40	36.3	16 9	100	90.6	42.3	60	145.0	67.6	20	199.4	93.0	80	253.8	118.3
41	37.2	17.3	101	91.5	42.7	161	145.9	68.0	221	200.3	93.4	281	254.7	118.8
42	38.1	17.7	02	92.4	43.1	62	146.8	68.5	22	201.2	93.8	82	255.6	119.2
43	39.0	18.2	03	93.3	43.5	63	147.7	68.9	23	202.1	94.2	83	256.5	119.6
44	39.9	18.6	04	94.3	44.0	64	148.6	69.3	24	203.0	94.7	84	257.4	120.0
45	40.8	19.0	05	95.2	44.4	65	149.5	69.7	25	203.9	95.1	85	258.3	120.4
46	41.7	19.4	06	96.1	44.8	66	150.4	70.2	26	204.8	95.5	86	259.2	120.9
47	42.6	19.9	07	97.0	45.2	67	151.4	70.6	27	205.7	95.9	87	260.1	121.3
48	43.5	20.3	08	97.9	45.6	68	152.3	71.0	28	206.6	96.4	88	261.0	121.7
49	44.4	20.7	09	98.8	46.1	69	153.2	71.4	29	207.5	96.8	89	261.9	122.1
50	45.3	21.1	10	99.7	46.5	70	154.1	71.8	30	208.4	97.2	90	262.8	122.6
51	46.2	21.6	111	100.6	46.9	171	155.0	72.3	231	209.4	97.6	291	263.7	123.0
52	47.1	22.0	12	101.5	47.3	72	155.9	72.7	32	210.3	98.0	92	264.6	123.4
53	48.0	22.4	13	102.4	47.8	73	156 8	73.1	33	211.2	98.5	93	265.5	123.8
54	48.9	22.8	14	103.3	48.2	74	157.7	73.5	34	212.1	98.9	94	266.5	124.2
55	49.8	23.2	15	104.2	48.6	75	158.6	73.9	35	213.0	99.3	95	267.4	124.7
56	50.8	23.7	16	105.1	49.0	76	159.5	74.4	36	213.9	99 7	96	268.3	125.1
57	51.7	24.1	17	106.0	49.4	77	160.4	74.8	37	214.8	100.2	97	269.2	125.5
58	52.6	24.5	18	106.9	49.9	78	161.3	75.2	38	215.7	100.6	98	270.1	125.9
59	53.5	24.9	19	107.8	50.3	79	162.2	75.6	39	216.6	101.0	99	271.0	126.4
60	54.4	25.4	120	108.8	50.7	180	163.1	76.1	240	217.5	101.4	300	271.9	126.8
Diff	Dep	Lat.	Diff	Dep.	Lat.	Diff	Dep.	Lat.	Diff	Dep.	Lat.	Diff	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 26 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	54.8	26.7	121	108.8	53.0	181	162.7	79.4	241	216.6	105.7
2	01.8	00.9	62	55.7	27.2	22	109.7	53.5	82	163.6	79.8	42	217.5	106.1
3	02.7	01.3	63	56.6	27.6	23	110.6	53.9	83	164.5	80.2	43	218.4	106.5
4	03.6	01.8	64	57.5	28.1	24	111.5	54.4	84	165.4	80.7	44	219.3	107.0
5	04.5	02.2	65	58.4	28.5	25	112.4	54.8	85	166.3	81.1	45	220.2	107.4
6	05.4	02.6	66	59.3	28.9	26	113.2	55.2	86	167.2	81.5	46	221.1	107.8
7	06.3	03.1	67	60.2	29.4	27	114.1	55.7	87	168.1	82.0	47	222.0	108.3
8	07.2	03.5	68	61.1	29.8	28	115.0	56.1	88	169.0	82.4	48	222.9	108.7
9	08.1	03.9	69	62.0	30.2	29	115.9	56.6	89	169.9	82.9	49	223.8	109.2
10	09.0	04.4	70	62.9	30.7	30	116.8	57.0	90	170.8	83.3	50	224.7	109.6
11	09.9	04.8	71	63.8	31.1	131	117.7	57.4	191	171.7	83.7	251	225.6	110.0
12	10.8	05.3	72	64.7	31.6	32	118.6	57.9	92	172.6	84.2	52	226.5	110.5
13	11.7	05.7	73	65.6	32.0	33	119.5	58.3	93	173.5	84.6	53	227.4	110.9
14	12.6	06.1	74	66.5	32.4	34	120.4	58.7	94	174.4	85.0	54	228.3	111.4
15	13.5	06.6	75	67.4	32.9	35	121.3	59.2	95	175.3	85.5	55	229.2	111.8
16	14.4	07.0	76	68.3	33.3	36	122.2	59.6	96	176.2	85.9	56	230.1	112.2
17	15.3	07.5	77	69.2	33.8	37	123.1	60.1	97	177.1	86.4	57	231.0	112.7
18	16.2	07.9	78	70.1	34.2	38	124.0	60.5	98	178.0	86.8	58	231.9	113.1
19	17.1	08.3	79	71.0	34.6	39	124.9	60.9	99	178.9	87.2	59	232.8	113.5
20	18.0	08.7	80	71.9	35.1	40	125.8	61.4	200	179.8	87.7	60	233.7	114.0
21	18.9	09.2	81	72.8	35.5	141	126.7	61.8	201	180.7	88.1	261	234.6	114.4
22	19.8	09.6	82	73.7	35.9	42	127.6	62.3	02	181.6	88.6	62	235.5	114.9
23	20.7	10.1	83	74.6	36.4	43	128.5	62.7	03	182.5	89.0	63	236.4	115.3
24	21.6	10.5	84	75.5	36.8	44	129.4	63.1	04	183.4	89.4	64	237.3	115.7
25	22.5	11.0	85	76.4	37.3	45	130.3	63.6	05	184.3	89.9	65	238.2	116.2
26	23.4	11.4	86	77.3	37.7	46	131.2	64.0	06	185.2	90.3	66	239.1	116.6
27	24.3	11.8	87	78.2	38.1	47	132.1	64.4	07	186.1	90.7	67	240.0	117.1
28	25.2	12.3	88	79.1	38.6	48	133.0	64.9	08	187.0	91.2	68	240.9	117.5
29	26.1	12.7	89	80.0	39.0	49	133.9	65.3	09	187.8	91.6	69	241.8	117.9
30	27 0	13.2	90	80.9	39.5	50	134.8	65.8	10	188.7	92.1	70	242.7	118.4
31	27.9	13.6	91	81.8	39.9	151	135.7	66.2	211	189.6	92.5	271	243.6	118.8
32	28.8	14.0	92	82.7	40.3	52	136.6	66.6	12	190.5	92.9	72	244.5	119.2
33	29.7	14.5	93	83.6	40.8	53	137.5	67.1	13	191.4	93.4	73	245.4	119.7
34	30.6	14.9	94	84.5	41.2	54	138.4	67.5	14	192.3	93.8	74	246.3	120.1
35	31.5	15.3	95	85.4	41.6	55	139.3	68.0	15	193.2	94.3	75	247.2	120.6
36	32.4	15.8	96	86.3	42.1	56	140.2	68.4	16	194.1	94.7	76	248.1	121.0
37	33.3	16.2	97	87.2	42.5	57	141.1	68.8	17	195.0	95.1	77	249.0	121.4
38	34.2	16.7	98	88.1	43 0	58	142.0	69.3	18	195.9	95.6	78	249.9	121.9
39	35.1	17.1	99	89.0	43.4	59	142.9	69.7	19	196.8	96.0	79	250.8	122.3
40	36.0	17.5	100	89.9	43.8	60	143.8	70.1	20	197.7	96.4	80	251.7	122.8
41	36.9	18.0	101	90.8	44.3	161	144.7	70.6	221	198.6	96.9	281	252.6	123.2
42	37.7	18.4	02	91.7	44.7	62	145.6	71.0	22	199.5	97.3	82	253.5	123.6
43	38.6	18.9	03	92.6	45.2	63	146.5	71.5	23	200.4	97.8	83	254.4	123.1
44	39.5	19.3	04	93.5	45.6	64	147.4	71.9	24	201.3	98.2	84	255.3	124.5
45	40.4	19.7	05	94.4	46.0	65	148.3	72.3	25	202.2	98.6	85	256.2	124.9
46	41.3	20.2	06	95.3	46.5	66	149.2	72.8	26	203.1	99.1	86	257.1	125.4
47	42.2	20.6	07	96.2	46.9	67	150.1	73.2	27	204.0	99.5	87	258.0	125.8
48	43.1	21.0	08	97.1	47.3	68	151.0	73.7	28	204.9	100.0	88	258.9	126.3
49	44.0	21.5	09	98.0	47.8	69	151.9	74.1	29	205.8	100.4	89	259.8	126.7
50	44.9	21.9	10	98.9	48.2	70	152.8	74.5	30	206.7	100.8	90	260.7	127.1
51	45.8	22.4	111	99.8	48 7	171	153.7	75.0	231	207.6	101.3	291	261.6	127.6
52	46.7	22 8	12	100.7	49.1	72	154.6	75.4	32	208.5	101.7	92	262.4	128.0
53	47.6	23.2	13	101.6	49.5	73	155.5	75.8	33	209.4	102.1	93	263.3	128.5
54	48.5	23.7	14	102.5	50.0	74	156.4	76.3	34	210.3	102.6	94	264.2	128.9
55	49.4	24 1	15	103.4	50.4	75	157.3	76.7	35	211.2	103.0	95	265.1	129.3
56	50.3	24.6	16	104.3	50.9	76	158.2	77.2	36	212.1	103.5	96	266.0	129.8
57	51.2	25.0	17	105.2	51.3	77	159.1	77.6	37	213.0	103.9	97	266.9	130.2
58	52.1	25.4	18	106.1	51.7	78	160.0	78.0	38	213.9	104.3	98	267.8	130.6
59	53.0	2579	19	107.0	52.2	79	160.9	78.5	39	214.8	104.8	99	268.7	131.1
60	53.9	26.3	20	107.9	52.6	180	161.8	78.9	240	215.7	105.2	300	269.6	131.5
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 64 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	54.4	27.7	121	107.8	54.9	181	161.3	82.2	241	214 7	109.4
2	01.8	00.9	62	55.2	28.1	22	108.7	55.4	82	162.2	82.6	42	215 6	109.9
3	02.7	01.4	63	56.1	28.6	23	109.6	55.8	83	163.1	83.1	43	216.5	110.3
4	03.6	01.8	64	57.0	29.1	24	110.5	56.3	84	163.9	83.5	44	217.4	110.8
5	04.5	02.3	65	57.9	29.5	25	111.4	56.8	85	164.8	84.0	45	218.3	111.2
6	05.3	02.7	66	58.8	30.0	26	112.3	57.2	86	165.7	84.4	46	219.2	111.7
7	06.2	03.2	67	59.7	30.4	27	113.2	57.7	87	166.6	84.9	47	220.1	112.1
8	07.1	03.6	68	60.6	30.9	28	114.0	58.1	88	167.5	85.4	48	221.0	112.6
9	08.0	04.1	69	61.5	31.3	29	114.9	58.6	89	168.4	85.8	49	221.9	113.0
10	0899	04.5	70	62.4	31.8	30	115 8	59.0	90	169.3	86.3	50	222.8	113.5
11	09.8	05.0	71	63.3	32.2	131	116.7	59.5	191	170.2	86.7	251	223.6	114.0
12	10.7	05.4	72	64.2	32.7	32	117.6	59.9	92	171.1	87.2	52	224.5	114.4
13	11.6	05.9	73	65.0	33.1	33	118.5	60.4	93	172.0	87.6	53	225.4	114.9
14	12.5	06.4	74	65.9	33.6	34	119.4	60.8	94	172.9	88.1	54	226.3	115.3
15	13.4	06.8	75	66.8	34.1	35	120.3	61.3	95	173.7	88.5	55	227.2	115.8
16	14.3	07.3	76	67.7	34.5	36	121.2	61.7	96	174.6	89.0	56	228.1	116.2
17	15.1	07.7	77	68.6	35.0	37	122.1	62.2	97	175 5	89.4	57	229.0	116.7
18	16.0	08.2	78	69.5	35.4	38	123.0	62.7	98	176.4	89.9	58	229.9	117.1
19	16.9	08.6	79	70.4	35.9	39	123.8	63.1	99	177.3	90.3	59	230.8	117.6
20	17.8	09.1	80	71.3	36.3	40	124.7	63.6	200	178.2	90.8	60	231.7	118.0
21	18.7	09.5	81	72.2	36.8	141	125.6	64.0	201	179.1	91.3	261	232.6	118.5
22	19.6	10.0	82	73.1	37.2	42	126.5	64.5	02	180.0	91.7	62	233.4	118.9
23	20.5	10.4	83	74.0	37.7	43	127.4	64.9	03	180.9	92.2	63	234.3	119.4
24	21.4	10.9	84	74.8	38.1	44	128.3	65.4	04	181.8	92.6	64	235.2	119.9
25	22.3	11.4	85	75.7	38.6	45	129.2	65.8	05	182.7	93.1	65	236.1	120.3
26	23.2	11.8	86	76.6	39.0	46	130.1	66.3	06	183.5	93.5	66	237.0	120.8
27	24.1	12.3	87	77.5	39.5	47	131.0	66.7	07	184.4	94.0	67	237.9	121.2
28	24.9	12.7	88	78.4	40.0	48	131.9	67.2	08	185.3	94.4	68	238.8	121.7
29	25.8	13.2	89	79.3	40.4	49	132.8	67.6	09	186.2	94.9	69	239.7	122.1
30	26.7	13.6	90	80.2	40.9	50	133.7	68.1	10	187.1	95.3	70	240.6	122.6
31	27.6	14.1	91	81.1	41.3	151	134.5	68.6	211	188.0	95.8	271	241.5	123.1
32	28.5	14.5	92	82.0	41.8	52	135.4	69.0	12	188.9	96.2	72	242.4	123.5
33	29.4	15.0	93	82.9	42.2	53	136.3	69.5	13	189.8	96.7	73	243.2	123.9
34	30.3	15.4	94	83.8	42.7	54	137.2	69.9	14	190.7	97.2	74	244.1	124.4
35	31.2	15.9	95	84.6	43.1	55	138.1	70 4	15	191.6	97.6	75	245.0	124.9
36	32.1	16.3	96	85.5	43.6	56	139.0	70.8	16	192.5	98.1	76	245.9	125.3
37	33.0	16.8	97	86.4	44.0	57	139.9	71.3	17	193.3	98.5	77	246.8	125.8
38	33.9	17.3	98	87.3	44.5	58	140.8	71.7	18	194.2	99.0	78	247.7	126.2
39	34.7	17.7	99	88.2	44.9	59	141.7	72.2	19	195.1	99.4	79	248.6	126.7
40	35.6	18.2	100	89.1	45.4	60	142.6	72.6	20	196.0	99.9	80	249.5	127.1
41	36.5	18.6	101	90.0	45.9	161	143.5	73.1	221	196.9	100.3	281	250.4	127.6
42	37.4	19.1	02	90.9	46.3	62	144.3	73.5	22	197.8	100.8	82	251.3	128.0
43	38.3	19.5	03	91.8	46.8	63	145.2	74.0	23	198.7	101.2	83	252.2	128.5
44	39.2	20.0	04	92.7	47.2	64	146.1	74.5	24	199.6	101.7	84	253.0	128.9
45	40.1	20.4	05	93.6	47.7	65	147.0	74.9	25	200.5	102.2	85	253.9	129.4
46	41.0	20.9	06	94.4	48.1	66	147.9	75.4	26	201.4	102.6	86	254.8	129.8
47	42.9	21.3	07	95.3	48.6	67	148.8	75.8	27	202.3	103.1	87	255.7	130.3
48	42.8	21.8	08	96.2	49.0	68	149.7	76.3	28	203.1	103.5	88	256.6	130.8
49	43.7	22.2	09	97.1	49.5	69	150.6	76.7	29	204.0	104.0	89	257.5	131.2
50	44.6	22.7	10	98.0	49.9	70	151.5	77.2	30	204.9	104.4	90	258.4	131.7
51	45.4	23.2	111	98.9	50.4	171	152.4	77.6	231	205.8	104.9	291	259.3	132.1
52	46.3	23.6	12	99.8	50.8	72	153.3	78.1	32	206.7	105.3	92	260.2	132.6
53	47.2	24.1	13	100.7	51.3	73	154.1	78.5	33	207.6	105.8	93	261.1	133 0
54	48.1	24.5	14	101.6	51.8	74	155.0	79.0	34	208.5	106.2	94	262.0	133.5
55	49.0	25.0	15	102.5	52.2	75	155.9	79.5	35	209.4	106.7	95	262.8	133.9
56	49.9	25 4	16	103.4	52.7	76	156.8	79.9	36	210.3	107.1	96	263.7	134.4
57	50.8	25.9	17	104.2	53.1	77	157.7	80.4	37	211.2	107.6	97	264.6	134.8
58	51.7	26.3	18	105.1	53.6	78	158.6	80 8	38	212.1	108.1	98	265.5	135.3
59	52.6	26.8	19	106.0	54.0	79	159.5	81.3	39	212.9	108.5	99	266.4	135.7
60	53.5	27.2	120	106.9	54.5	180	160.4	81.7	240	213.8	109.0	300	267.3	136.2
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep	Lat

TABLE III. Difference of Latitude and Departure for 28 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.9	28.6	121	106.8	56.8	181	159.8	85.0	241	212.8	113.1
2	01.8	00.9	62	54.7	29.1	22	107.7	57.3	82	160.7	85.4	42	213.7	113.6
3	02.6	01.4	63	55.6	29.6	23	108.6	57.7	83	161.6	85.9	43	214.6	114.1
4	03.5	01.9	64	56.5	30.0	24	109.5	58.2	84	162.5	86.4	44	215.5	114.6
5	04.4	02.3	65	57.4	30.5	25	110.4	58.7	85	163.4	86.9	45	216.3	115.0
6	05.3	02.8	66	58.3	31.0	26	111.3	59.2	86	164.2	87.3	46	217.2	115.5
7	06.2	03.3	67	59.2	31.5	27	112.1	59.6	87	165.1	87.8	47	218.1	115.9
8	07.1	03.8	68	60.0	31.9	28	113.0	60.1	88	166.0	88.3	48	219.0	116.4
9	07.9	04.3	69	60.9	32.4	29	113.9	60.6	89	166.9	88.7	49	219.9	116.9
10	08.8	04.7	70	61.8	32.9	30	114.8	61.0	90	167.8	89.2	50	220.8	117.4
11	09.7	05.2	71	62.7	33.3	131	115.7	61.5	191	168.7	89.7	251	221.6	117.8
12	10.6	05.6	72	63 6	33.8	32	116.6	62.0	92	169.5	90.1	52	222.5	118.3
13	11.5	06.1	73	64.5	34.3	33	117.4	62.4	93	170.4	90.6	53	223.4	118.8
14	12.4	06.6	74	65.3	34.7	34	118.3	62.9	94	171 3	91.1	54	224.3	119.2
15	13.2	07.0	75	66.2	35.2	35	119.2	63.4	95	172.2	91.6	55	225.2	119.7
16	14.1	07.5	76	67.1	35.7	36	120.1	63.9	96	173.1	92.0	56	226.0	120.2
17	15.0	08.0	77	68.0	36.2	37	121.0	64 3	97	174.0	92.5	57	226.9	120.7
18	16.9	08.5	78	68.9	36.6	38	121.9	64.8	98	174.8	93.0	58	227.8	121.1
19	16.8	08.9	79	69.8	37.1	39	122.7	65.3	99	175.7	93.4	59	228.7	121.6
20	17.7	09.4	80	70.6	37.6	40	123.6	65.7	200	176.6	93.9	60	229.6	122.1
21	18.5	09.9	81	71.5	38.0	141	124.5	66 2	201	177.5	94.4	261	230.5	122.5
22	19.4	10.3	82	72.4	38.5	42	125.4	66.7	02	178.4	94.8	62	231.3	123.0
23	20.3	10.8	83	73.3	39.0	43	126.3	67.1	03	179.2	95.3	63	232.2	123.5
24	21.2	11.3	84	74.2	39.4	44	127.2	67.6	04	180.1	95.8	64	233.1	123.9
25	22.1	11.7	85	75.1	39.9	45	128.0	68.1	05	181.0	96.2	65	234 0	124.4
26	23.0	12.2	86	75.9	40.4	46	128.9	68.5	06	181.9	96.7	66	234.9	124.9
27	23.8	12.7	87	76.8	40.8	47	129.8	69.0	07	182.8	97.2	67	235.8	125.4
28	24.7	13.1	88	77.7	41.3	48	130.7	69.5	08	183.7	97.7	68	236.6	125.9
29	25.6	13.6	89	78.6	41.8	49	131.6	70.0	09	184.5	98.1	69	237.5	126.3
30	26.5	14.1	90	79.5	42.3	50	132.5	70.4	10	185.4	98.6	70	238.4	126.8
31	27.4	14.6	91	80.4	42.7	151	133.3	70.9	211	186.3	99.1	271	239.3	127.2
32	28.3	15.0	92	81.2	43.2	52	134.2	71.4	12	187.2	99.5	72	240.2	127.7
33	29.1	15.5	93	82.1	43.7	53	135.1	71.8	13	188.1	100.0	73	241.1	128.2
34	30.0	16.0	94	83.0	44.1	54	136.0	72.3	14	189.0	100.5	74	241.9	128.6
35	30.9	16.4	95	83.9	44.6	55	136.9	72.8	15	189.8	100.9	75	242.8	129.1
36	31.8	16.9	96	84.8	45.1	56	137.7	73.2	16	190.7	101.4	76	243.7	129.6
37	32.7	17.4	97	85.7	45.5	57	138.6	73.7	17	191.6	101.9	77	244.6	130.1
38	33.6	17.8	98	86.5	46.0	58	139.5	74.2	18	192.5	102.4	78	245.5	130.5
39	34.5	18.3	99	87.4	46.5	59	140.4	74.6	19	193.4	102.8	79	246.4	131.0
40	35.3	18.8	100	88.3	47.0	60	141.3	75.1	20	194.3	103.3	80	247.2	131.5
41	36.2	19 2	101	89.2	47.4	161	142.2	75.6	221	195.1	103.8	281	248.1	131.9
42	37.1	19.7	02	90.1	47.9	62	143.0	76.1	22	196.0	194.2	82	249.0	132.4
43	38.0	20.2	03	90.9	48.4	63	143.9	76.5	23	196.9	104.7	83	249.9	132.9
44	38.9	20.7	04	91.8	48.8	64	144.8	77.0	24	197.8	105.2	84	250.8	133.3
45	39.7	21.1	05	92.7	49.3	65	145.7	77.5	25	198.7	105.6	85	251.7	133.8
46	40.6	21.6	06	93.6	49.8	66	146.6	77.9	26	199.6	106.1	86	252.5	134.3
47	41.5	22.1	07	94.5	50.2	67	147.5	78.4	27	200.4	106.6	87	253.4	134 7
48	42.4	22.5	08	95.4	50.7	68	148.3	78.9	28	201 3	107.0	88	254.3	135.2
49	43.3	23.0	09	96.2	51.2	69	149.2	79.3	29	202.2	107.5	89	255.2	135.7
50	44.2	23.5	10	97.1	51.6	70	150.1	79.8	30	203.1	108.0	90	256.1	136.1
51	45.0	23.9	111	98.0	52.1	171	151.0	80.3	231	204.0	108.5	291	257.0	136.6
52	45.0	24.4	12	98.9	52.6	72	151.9	80.8	32	204.9	108.9	92	257.8	137.1
53	46.8	24 9	13	99.8	53.1	73	152.8	81.2	33	205.7	109.4	93	258.7	137.6
54	47.7	25.4	14	100.7	53.5	74	153.6	81.7	34	206.6	109.9	94	259.6	138.0
55	48.6	25.8	15	101.5	54.0	75	154.5	82.2	35	207.5	110.3	95	260.5	138.5
56	49.4	26.3	16	102.4	54.5	76	155.4	82.6	36	208.4	110.8	96	260.4	139.0
57	50.3	26.8	17	103.3	54.9	77	156.3	83.1	37	209.3	111.3	97	261.3	139.4
58	51.2	27.2	18	104.2	55.4	78	157.2	83.6	38	210.2	111.7	98	262.1	139.9
59	52.1	27.7	19	105.1	55.9	79	158.1	84.0	39	211.0	112 2	99	263.0	140.4
60	53.0	28.2	120	106.0	56.3	180	158.9	84.5	240	211.9	112.7	300	264.1	140.9
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 62 Degrees.

Table III. Difference of Latitude and Departure for 29 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.4	29.6	121	105.8	58.7	181	158.3	87.7	241	210.8	116.8
2	01.7	01.0	62	54.2	30.1	22	106.7	59.1	82	159.2	88.2	42	211.7	117.3
3	02.6	01.5	63	55.1	30.5	23	107.6	59.6	83	160.1	88.7	43	212.5	117.8
4	03.5	01.9	64	56.0	31.0	24	108.5	60.1	84	160.9	89.2	44	213.4	118.3
5	04.4	02.4	65	56.8	31.5	25	109.3	60.6	85	161.8	89.7	45	214.3	118.8
6	05.2	02.9	66	57.7	32.0	26	110.2	61.1	86	162.7	90.2	46	215.2	119.3
7	06.1	03.4	67	58.6	32.5	27	111.1	61.6	87	163.6	90.7	47	216.0	119.7
8	07.0	03.9	68	59.5	33.0	28	111.9	62.1	88	164.4	91.1	48	216.9	120.2
9	07.9	04.4	69	60.3	33.5	29	112.8	62.5	89	165.3	91.6	49	217.8	120.7
10	08.7	04.8	70	61.2	33.9	30	113.7	63.0	90	166.2	92.1	50	218.7	121.2
11	09.6	05.3	71	62.1	34.4	131	114.6	63.5	191	167.0	92.6	251	219.5	121.7
12	10.5	05.8	72	63.0	34.9	32	115.4	64.0	92	167.9	93.1	52	220.4	122.2
13	11.4	06.3	73	63.8	35.4	33	116.3	64.5	93	168.8	93.6	53	221.3	122.7
14	12.2	06.8	74	64.7	35.9	34	117.2	65.0	94	169.7	94.1	54	222.2	123.1
15	13.1	07.3	75	65.6	36.4	35	118.1	65 4	95	170.5	94.5	55	223.0	123.6
16	14.0	07.8	76	66.5	36.8	36	118.9	65.9	96	171.4	95.0	56	223.9	124.1
17	14.9	08.2	77	67.3	37.3	37	119.8	66.4	97	172.3	95.5	57	224.8	124.6
18	15.7	08.7	78	68.2	37.8	38	120.7	66.9	98	173.2	96.0	58	225.6	125.1
19	16.6	09.2	79	69.1	38.3	39	121.6	67 4	99	174.0	96.5	59	226.5	125.6
20	17.5	09.7	80	70.0	38.8	40	122.4	67.9	200	174.9	97.0	60	227.4	126.0
21	18.4	10.2	81	70.8	39.3	141	123.3	68.4	201	175.8	97.4	261	228.3	126.5
22	19.2	10.7	82	71.7	39 8	42	124.2	68.9	02	176.7	97.9	62	229.1	127.0
23	20.1	11.2	83	72.6	40.2	43	125.1	69.3	03	177.5	98.4	63	230.0	127.5
24	21.0	11.6	84	73.5	40.7	44	125.9	69.8	04	178.4	98.9	64	230.9	128.0
25	21.9	12.1	85	74.3	41.2	45	126.8	70.3	05	179.3	99.4	65	231.8	128.5
26	22.7	12.6	86	75.2	41.7	46	127.7	70.8	06	180.2	99.9	66	232.6	129.0
27	23.6	13.1	87	76.1	42.2	47	128.6	71.3	07	181.0	100.4	67	233.5	129.4
28	24.5	13.6	88	77.0	42.7	48	129.4	71.8	08	181.9	100.8	68	234.4	129.9
29	25.4	14.0	89	77.8	43.1	49	130.3	72.2	09	182.8	101.3	69	235.3	130.4
30	26.2	14.5	90	78.7	43.6	50	131.2	72.7	10	183.7	101.8	70	236.1	130.9
31	27 1	15 0	91	79.6	44 1	151	132.1	73.2	211	184.5	102.3	271	237.0	131.4
32	28.0	15.5	92	80.5	44.6	52	132.9	73.7	12	185.4	102.8	72	237.9	131.9
33	28.9	16.0	93	81.3	45.1	53	133.8	74.2	13	186.3	103.3	73	238.8	132.4
34	29.7	16.5	94	82.2	45.6	54	134.7	74.7	14	187.2	103.7	74	239.6	132.8
35	30.6	17.0	95	83.1	46.1	55	135.6	75.1	15	188.0	104.2	75	240.5	133.3
36	31.5	17.5	96	84.0	46.5	56	136.4	75.6	16	188.9	104.7	76	241.4	133.8
37	32.4	17.9	97	84.8	47.0	57	137.3	76.1	17	189.8	105.2	77	242.3	134.3
38	33.2	18.4	98	85.7	47.5	58	138.2	76.6	18	190.7	105.7	78	243.1	134.8
39	34 1	18.9	99	86.6	48.0	59	139.1	77.1	19	191.5	106.2	79	244.0	135.3
40	35.0	19.4	100	87.5	48.5	60	139.9	77 6	20	192.4	106.7	80	244.9	135.7
41	35.9	19.9	101	88.3	49.0	161	140.8	78.1	221	193.3	107.1	281	245.8	136.2
42	36.7	20.4	02	89.2	49.4	62	141.7	78.5	22	194.2	107.6	82	246.6	136.7
43	37.6	20.8	03	90.1	49.9	63	142.6	79.0	23	195.0	108.1	83	247.5	137.2
44	38.5	21.3	04	91.0	50.4	64	143.4	79.5	24	195.9	108.6	84	248.4	137.7
45	39.4	21.8	05	91.8	50.9	65	144.3	80.0	25	196.8	109.1	85	249.3	138.2
46	40.2	22.3	06	92.7	51.4	66	145.2	80.5	26	197.7	109.6	86	250.1	138.7
47	41.1	22.8	07	93.6	51.9	67	146.1	81.0	27	198.5	110.0	87	251.0	139.1
48	42 0	23.3	08	94.5	52 4	68	146.9	81.4	28	199.4	110.5	88	251.9	139.6
49	42.9	23.8	09	95.3	52.8	69	147.8	81.9	29	200.3	111.0	89	252.8	140.1
50	43.7	24.2	10	96.2	53.3	70	148.7	82.4	30	201.2	111.5	90	253.6	140 6
51	44.6	24.7	111	97.1	53 8	171	149.6	82.9	231	202.0	112.0	291	254.5	141.1
52	45.5	25.2	12	98.0	54.3	72	150.4	83.4	32	202.9	112.5	92	255.4	141.6
53	46.4	25.7	13	98.8	54.8	73	151.3	83.9	33	203.8	113.0	93	256.3	142.0
54	47.2	26.2	14	99.7	55.3	74	152.2	84.4	34	204.7	113.4	94	257.1	142.5
55	48 1	26.7	15	100.6	55.8	75	153.1	84.8	35	205.5	113.9	95	258.0	143.0
56	49.0	27.1	16	101.5	56.2	76	153.9	85.3	36	206.4	114.4	96	258.9	143.5
57	49.9	27.6	17	102.3	56.7	77	154.8	85.8	37	207.3	114.9	97	259.8	144.0
58	50.7	28.1	18	103.2	57.2	78	155.7	86 3	38	208.2	115.4	98	260.6	144.5
59	51.6	28.6	19	104.1	57.7	79	156.6	86.8	39	209.0	115.9	99	261.5	145.0
60	52 5	29.1	120	105.0	58.2	180	157.4	7.3	240	209.9	116.4	300	262.4	145.4
Dist	Dep	Lat.	Dist	Dep.	Lat	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 61 Degrees.

Table III. Difference of Latitude and Departure for 30 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.9	00.5	61	52.8	30.5	121	104.8	60.5	181	156.7	90.5	241	208.7	120.5
2	01.7	01.0	62	53.7	31.0	22	105.7	61.0	82	157.6	91.0	42	209.6	121.0
3	02.6	01.5	63	54.6	31.5	23	106.5	61.5	83	158.5	91.5	43	210.4	121.5
4	03.5	02.0	64	55.4	32.0	24	107.4	62.0	84	159.3	92.0	44	211.3	122.0
5	04.3	02.5	65	56.3	32.5	25	108.3	62.5	85	160.2	92.5	45	212.2	122.5
6	05.2	03.0	66	57.2	33.0	26	109.1	63.0	86	161.1	93.0	46	213.0	123.0
7	06.1	03.5	67	58.0	33.5	27	110.0	63.5	87	161.9	93.5	47	213.9	123.5
8	06.9	04.0	68	58.9	34.0	28	110.8	64.0	88	162.8	94.0	48	214.8	124.0
9	07.8	04.5	69	59.8	34.5	29	111.7	64.5	89	163.7	94.5	49	215.6	124.5
10	08.7	05.0	70	60.6	35.0	30	112.6	65.0	90	164.5	95.0	50	216.5	125.0
11	09.5	05 5	71	61.5	35.5	131	113.4	65.5	191	165.4	95.5	251	217.4	125.5
12	10.4	06.0	72	62.4	36.0	32	114.3	66.0	92	166.3	96.0	52	218.2	126.0
13	11.3	06.5	73	63.2	36.5	33	115.2	66.5	93	167.1	96.5	53	219.1	126.5
14	12.1	07.0	74	64.1	37.0	34	116.0	67.0	94	168.0	97 0	54	220.0	127.0
15	13.0	07.5	75	65.0	37.5	35	116.9	67.5	95	168.9	97.5	55	220.8	127.5
16	13.9	08.0	76	65.8	38.0	36	117.8	68.0	96	169.7	98 0	56	221.7	128.0
17	14.7	08.5	77	66.7	38.5	37	118.6	68.5	97	170.6	98.5	57	222.6	128 5
18	15.6	09.0	78	67.5	39.0	38	119.5	69.0	98	171.5	99.0	58	223.4	129.0
19	16.5	09.5	79	68.4	39.5	39	120.4	69.5	99	172.3	99.5	59	224.3	129.5
20	17.3	10.0	80	69.3	40.0	40	121.2	70.0	200	173.2	100.0	60	225.2	130.0
21	18.2	10.5	81	70.1	40.5	141	122.1	70.5	201	174.1	100.5	261	226.0	130.5
22	19.1	11.0	82	71.0	41.0	42	123.0	71.0	02	174.9	101.0	62	226.9	131.0
23	19.9	11.5	83	71.9	41.5	43	123.8	71.5	03	175.8	101.5	63	227.8	131.5
24	20.8	12.0	84	72.7	42.0	44	124.7	72.0	04	176.7	102.0	64	228.6	132.0
25	21.7	12.5	85	73.6	42.5	45	125.6	72.5	05	177.5	102.5	65	229.5	132.5
26	22.5	13.0	86	74.5	43.0	46	126.4	73.0	06	178.4	103.0	66	230.4	133.0
27	23.4	13.5	87	75.3	43.5	47	127.3	73.5	07	179.3	10 .5	67	231.2	133 5
28	24.2	14.0	88	76.2	44.0	48	128.2	74.0	08	180.1	104.0	68	232.1	134.0
29	25.1	14.5	89	77.1	44.5	49	129.0	74.5	09	181.0	104.5	69	233.0	134.5
30	26.0	15.0	90	77.9	45.0	50	129.9	75.0	10	181.9	105.0	70	233.8	135.0
31	26.8	15.5	91	78.8	45.5	151	130.8	75.5	211	182.7	105.5	271	234.7	135.5
32	27.7	16.0	92	79.7	46.0	52	131.7	76.0	12	183.6	106.0	72	235.6	136.0
33	28.6	16.5	93	80.5	46.5	53	132.5	76.5	13	184.5	106.5	73	236.4	136.5
34	29.4	17.0	94	81.4	47.0	54	133.4	77.0	14	185.3	107.0	74	237.3	137.0
35	30.3	17.5	95	82.3	47.5	55	134.2	77.5	15	186.2	107.5	75	238.2	137.5
36	31.2	18.0	96	83.1	48.0	56	135.1	78.0	16	187.1	108.0	76	239.0	138.0
37	32.0	18.5	97	84.0	48.5	57	136.0	78.5	17	187.9	108.5	77	239.9	138.5
38	32.9	19.0	98	84.9	49.0	58	136.8	79.0	18	188.8	109.0	78	240.7	139.0
39	33.8	19.5	99	85.7	49.5	59	137.7	79 5	19	189.7	109.5	79	241.6	139.5
40	34.6	20.0	100	86.6	50.0	60	138.6	80.0	20	190.5	110.0	80	242 5	140.0
41	35.5	20.5	101	87.5	50.5	161	139.4	80.5	221	191.4	110.5	281	243.3	140 5
42	36.4	21.0	02	88.3	51.0	62	140.3	81.0	22	192.3	111.0	82	244.2	141.0
43	37.2	21.5	03	89.2	51.5	63	141.2	81.5	23	193.1	111.5	83	245.1	141.5
44	38.1	22.0	04	90.1	52.0	64	142.0	82.0	24	194.0	112.0	84	245.9	142.0
45	39.0	22.5	05	90.9	52.5	65	142.9	82.5	25	194.9	112.5	85	246.8	142.5
46	39.8	23.0	06	91.8	53.0	66	143.8	83.0	26	195.7	113.0	86	247.7	143.0
47	40.7	23.5	07	92.7	53.5	67	144.6	83.5	27	196.6	113.5	87	248.5	143.5
48	41.5	24.0	08	93.5	54.0	68	145.5	84.0	28	197.4	114.0	88	249.4	144.0
49	42.4	24.5	09	94.4	54.5	69	146.4	84.5	29	198.3	114.5	89	250.3	144.5
50	43.3	25.0	10	95.3	55.0	70	147.2	85.0	30	199.2	115.0	90	251.1	145.0
51	44.2	25.5	111	96.1	55.5	171	148.1	85.5	231	200.0	115.5	291	252.0	145.5
52	45 0	26.0	12	97.0	56.0	72	149.0	86.0	32	200.9	116.0	92	252.9	146.0
53	45.9	26.5	13	97.9	56.5	73	149.8	86.5	33	201.8	116.5	93	253.7	146.5
54	46.8	27.0	14	98.7	57.0	74	150.7	87.0	34	202.6	117.0	94	254.6	147.0
55	47.6	27.5	15	99.6	57.5	75	151.6	87.5	35	203.5	117.5	95	255.5	147.5
56	48.5	28.0	16	100.5	58.0	76	152.4	88.0	36	204.4	118.0	96	256.3	148.0
57	49.4	28.5	17	101.3	58.5	77	153.3	88.5	37	205.2	118.5	97	257.2	148.5
58	50.2	29.0	18	102.2	59.0	78	154.1	89.0	38	206.1	119.0	98	258.1	149.0
59	51.1	29.5	19	103.1	59.5	79	155.0	89.5	39	207.0	119.5	99	258.9	149.5
60	52.0	30.0	120	103.9	60.0	180	155.9	90.0	240	207.8	120.0	300	259.8	150.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 60 Degrees.

TABLE III. Difference of Latitude and Departure for 31 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	52.3	31.4	121	103.7	62.3	181	155.1	93.2	241	206.5	124.1
2	01.7	01.0	62	53.1	31.9	22	104.6	62.8	82	156.0	93.7	42	207.4	124.6
3	02.6	01.5	63	54.0	32.4	23	105.4	63.3	83	156.8	94.2	43	208.3	125.1
4	03.4	02.1	64	54.8	33.6	24	106.3	63.9	84	157.7	94.8	44	209.1	125.6
5	04.3	02.6	65	55.7	33.5	25	107.1	64.4	85	158.5	95.3	45	210.0	126.2
6	05.1	03.1	66	56.6	34.0	26	108.0	64.9	86	159.4	95.8	46	210.8	126.7
7	06.0	03.6	67	57.4	34.5	27	108.8	65.4	87	160.3	96.3	47	211.7	127.2
8	06.9	04.1	68	58.3	35.0	28	109.7	65.9	88	161.1	96.8	48	212.5	127.7
9	07.7	04.6	69	59.1	35.5	29	110.6	66.4	89	162.0	97.3	49	213.4	128.2
10	08.6	05.2	70	60.0	36.1	30	111.4	67.0	90	162.8	97.9	50	214.3	128.8
11	09.4	05.7	71	60.8	36.6	131	112.3	67.5	191	163.7	98 4	251	215.1	129.3
12	10.3	06.2	72	61.7	37.1	32	113.1	68.0	92	164.5	98.9	52	216.0	129.8
13	11.1	06.7	73	62 6	37.6	33	114.0	68.5	93	165.4	99.4	53	216.8	130.3
14	12.0	07.2	74	63.4	38.1	34	114.8	69.0	49	166.3	99 9	54	217.7	130.8
15	12.9	07.7	75	64.3	38.6	35	115.7	69.5	95	167.1	100.4	55	218.5	131.3
16	13.7	08.2	76	65.1	39.1	36	116.6	70.0	96	168.0	100 9	56	219.4	131.8
17	14.6	08.8	77	66.0	39.7	37	117.4	70.6	97	168.8	101.5	57	220.2	132.4
18	15.4	09.3	78	66.8	40 2	38	118.3	71.1	98	169.7	102.0	58	221.1	132.9
19	16.3	09.8	79	67.7	40.7	39	119.1	71.6	99	170.5	102.5	59	222.1	133.4
20	17.1	10.3	80	68.6	41.2	40	120.0	72.1	200	171.4	103.0	60	222.8	133.9
21	18.0	10.8	81	69.4	41.7	141	120.8	72.6	201	172.3	103.5	261	223.7	134.4
22	18.9	11.3	82	70.3	42.2	42	121.7	73.1	02	173.1	104.0	62	224.5	134.9
23	19.7	11.8	83	71.1	42.7	43	122.6	73.6	03	174.0	104.5	63	225.4	135 4
24	20.6	12.4	84	72.0	43.3	44	123.4	74.2	04	174.8	105.0	64	226.2	136.0
25	21.4	12.9	85	72.8	43.8	45	124.3	74.7	05	175.7	105.6	65	227.1	136.5
26	22.5	13.4	86	73.7	44.3	46	125.1	75.2	06	176.5	106.1	66	228.0	137.0
27	23.1	13.9	87	74.6	44.8	47	126.0	75.7	07	177.4	106 6	67	228.8	137.5
28	24.0	14.4	88	75.4	45.3	48	126.8	76.2	08	178.3	107.1	68	229.7	138.0
29	24.9	14.9	89	76.3	45.8	49	127.7	76.7	09	179.1	107.6	69	230.5	138.5
30	25.7	15.4	90	77.1	46.4	50	128.6	77.3	10	180.0	108.2	70	231.4	139.1
31	26.6	16.0	91	78.0	46.9	151	129.4	77.8	211	180.8	108.7	271	232.2	139.6
32	27.4	16.5	92	78.8	47.4	52	130.3	78.3	12	181.7	109.2	72	233.1	140.1
33	28.3	17.0	93	79.7	47.9	53	131.1	78.8	13	182.5	109.7	73	234.0	140.6
34	29.1	17.5	94	80.6	48.4	54	132.0	79.3	14	183.4	110.2	74	234.8	141.1
35	30.0	18.0	95	81.4	48.9	55	132.8	79.8	15	184.3	110.7	75	235.7	141.6
36	30.9	18.5	96	82.3	49.4	56	133.7	80.3	16	185.1	111.2	76	236.5	142.1
37	31.7	19.1	97	83.1	50.0	57	134.5	80.9	17	186.0	111.8	77	237.4	142.7
38	32.6	19.6	98	84.0	50.5	58	135.4	81.4	18	186.8	112.3	78	238.2	143.2
39	33.4	20.1	99	84.8	51 0	59	136.3	81.9	19	187.7	112.8	79	239.1	143.7
40	34.3	20.6	100	85.7	51 5	60	137.1	82.4	20	188.5	113.3	80	240.0	144.2
41	35.1	21.1	101	86.6	52.0	161	138.0	82.9	221	189.4	113.8	281	240.8	144.7
42	36.0	21.6	02	87.4	52.5	62	138.8	83.4	22	190.3	114.3	82	241.7	145.2
43	36.9	22.1	03	88.2	53.0	63	139.7	83.9	23	191.1	114.8	83	242.5	145.7
44	37.9	22.6	04	89.1	53.6	64	140.5	84.5	24	192.0	115.4	84	243.4	146.3
45	38.6	23.2	05	90.0	54.1	65	141.4	85.0	25	192.8	115.9	85	244.2	146.8
46	39.4	23.7	06	90.8	54.6	66	142.3	85.5	26	193.7	116.4	86	245.1	147.3
47	40.3	24.2	07	91.7	55.1	67	143.1	86.0	27	194.5	116.9	87	246.0	147.8
48	41.1	24.7	08	92.6	55.6	68	144.0	86 5	28	195.4	117.4	88	246.8	148.3
49	42.0	25.2	09	93.4	56.1	69	144.8	87.0	29	196.3	117.9	89	247.7	148.8
50	42.9	25.8	10	94.3	56.7	70	145.7	87.6	30	197.1	118.5	90	248.5	149.4
51	43.7	26.3	111	95.1	57.2	171	146.5	88.1	231	198.0	119.0	291	249.4	149.8
52	44.6	26.8	12	96.0	57.7	72	147.4	88.6	32	198.8	119.5	92	250.2	150.4
53	45.4	27.3	13	96.8	58.2	73	148.3	89.1	33	199.7	120.0	93	251.1	150.9
54	46.3	27.8	14	97.7	58.7	74	149.1	89.6	34	200.5	120.5	94	252.0	151.4
55	47.1	28.3	15	98.6	59.2	75	150.0	90.1	35	201.4	121.0	95	252.8	151.9
56	48.0	28.8	16	99.4	59.7	76	150.8	90.6	36	202.3	121 5	96	253.7	152.4
57	48.8	29.4	17	100.3	60.3	77	151.7	91.2	37	203.1	122.1	97	254 5	153.0
58	49.7	29.9	18	101.1	60.8	78	152.5	91.7	38	204.0	122.6	98	255.4	153.5
59	50.6	30.4	19	102.0	61.3	79	153.4	92.2	39	204.8	123.1	99	256.2	154.0
60	51.4	30.9	120	102.8	61.8	180	154.3	92.7	240	205.7	123.6	300	257.1	154.5
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 59 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.5	61	51.7	32.3	121	102.6	64.1	181	153.5	95.9	241	204.4	127.7
2	01.7	01.1	62	52.6	32.9	22	103.5	64.7	82	154.4	96.5	42	205.2	128.3
3	02.5	01.6	63	53.4	33.4	23	104.3	65.2	83	155.2	97.0	43	206.1	128.8
4	03.2	02.1	64	54.3	33.9	24	105.2	65.7	84	156.0	97.5	44	206.9	129.3
5	04.4	02.6	65	55.1	34.5	25	106.0	66.3	85	156.9	98.1	45	207.8	129.5
6	05.1	03.2	66	56.0	35.0	26	106.8	66.8	86	157.7	98.6	46	208.6	130.4
7	05.9	03.7	67	56.8	35.5	27	107.7	67.3	87	158.6	99.1	47	209.5	130.9
8	06.8	04.2	68	57.7	36.0	28	108.5	67.8	88	159.4	99.6	48	210.3	131.4
9	07.6	04.8	69	58.5	36.6	29	109.4	68.4	89	160.3	100.2	49	211.2	132.0
10	08.5	05.3	70	59.4	37.1	30	110.2	68.9	90	161.1	100.7	50	212.0	132.5
11	09.3	05.8	71	60.2	37.6	131	111.1	69.4	191	162.0	101.2	251	212.8	133.0
12	10.2	06.4	72	61.1	38.2	32	111.9	70.0	92	162.8	101.8	52	213.7	233.6
13	11.0	06.9	73	61.9	38.7	33	112.8	70.5	93	163.7	102.3	53	214.5	134.1
14	11.9	07.4	74	62.8	39.2	34	113.6	71.0	94	164.5	102.8	54	215.4	134.6
15	12.7	08.0	75	63.6	39.8	35	114.5	71.6	95	165.4	103.4	55	216.2	135.2
16	13.6	08.5	76	64.4	40.3	36	115.3	72.1	96	166.2	103.9	56	217.1	135.7
17	14.4	09.0	77	65.3	40.8	37	116.2	72.6	97	167.1	104.4	57	117.9	136.2
18	15.3	09.5	78	66.1	41.3	38	117.0	73.1	98	167.9	104.9	58	218.8	136.7
19	16.1	10.1	79	67.0	41.9	39	117.9	73.7	99	168.8	105.5	59	219.6	137.3
20	17.0	10.6	80	67.8	42.4	40	118.8	74.2	200	169.6	106.0	60	220.3	137.8
21	17.8	11.1	81	68.7	42.9	141	119.6	74.7	201	170.4	106.5	261	221.3	138.3
22	18.7	11.7	82	69.5	43.5	42	120.4	75.3	02	171.3	107.1	62	222.2	138.9
23	19.5	12.2	83	70.4	44.0	43	121.3	75.8	03	172.1	107.6	63	223.0	139.4
24	20.4	12.7	84	71.2	44.5	44	122.1	76.3	04	173.0	108.1	64	223.9	139.9
25	21.3	13.3	85	72.1	45.1	45	123.0	76.9	05	173.8	108.7	65	224.7	140.5
26	22.0	13.8	86	72.9	45.6	46	123.8	77.4	06	174.7	109.2	66	225.6	141.0
27	22.9	14.3	87	73.8	46.1	47	124.7	77.9	07	175.5	109.7	67	226.4	141.5
28	23.7	14.8	88	74.6	46.6	48	125.5	78.4	08	176.6	110.2	68	227.3	142.0
29	24.6	15.4	89	75.4	47.2	49	126.4	79.0	09	177.2	110.8	69	228.1	142.6
30	25.4	15.9	90	76.3	47.7	50	127.2	79.5	10	178.1	111.3	70	229.0	143 1
31	26.3	16.4	91	77.2	48.2	151	128.0	80.0	211	178.9	111.8	271	229.8	143.6
32	27.1	17.0	92	78.0	48.8	52	128.9	80.6	12	179.8	112.4	72	230.7	144.2
33	28.0	17.5	93	78.9	49.3	53	129.7	81.1	13	180.5	112.9	73	231.5	144.7
34	28.8	18.0	94	79.7	49.8	54	130.6	81.6	14	181.4	113.4	74	232.4	145.2
35	29.7	18.6	95	80.6	50.4	55	131.4	82.2	15	182.3	114.0	75	233.2	145.8
36	30.5	19.1	96	81.4	50.9	56	132.3	82.7	16	183.2	114.5	76	234.0	146.3
37	31.4	19.6	97	82.3	51.4	57	133.1	83.2	17	184.0	115.0	77	234.9	146.8
38	32.2	20.1	98	83.1	51.9	58	134.0	83.7	18	184.9	115.5	78	235.7	147.3
39	33.1	20.7	99	84.0	52.5	59	134.8	84.3	19	185.7	116.1	79	236.6	147.9
40	33.9	21 2	100	84.8	53.0	60	135.7	84.8	20	186.6	116.6	80	237.4	148.4
41	34.8	21.7	101	85.6	53.5	161	136.5	85.3	221	187.4	117.1	281	238.3	148.9
42	35.6	22.3	02	86.5	54.1	62	137.4	85.9	22	188.3	117.7	82	239.1	149.5
43	36.5	22.8	03	87.3	54.6	63	138.2	86.4	23	189.1	118.2	83	240.0	150.0
44	37.3	23.3	04	88.2	55.1	64	139.1	86.9	24	190.0	118.7	84	240.8	150.5
45	38.2	23.9	05	89.0	55.7	65	139.9	87.5	25	190.8	119.3	85	241.7	151.1
46	39.0	24.4	06	89.9	56.2	66	140.8	88.0	26	191.6	119.8	86	242.5	151.6
47	39 9	24.9	07	90.7	56.7	67	141.6	88.5	27	192.5	120.3	87	243.4	152.1
48	40.7	25.4	08	91.6	57.2	68	142.5	89.0	28	193.3	120.8	88	244.2	152.6
49	41.6	26.0	09	92.4	57.8	69	143.3	89.6	29	194.2	121.4	89	245.1	153.2
50	42.4	26.5	10	93.3	58.3	70	144.2	90.1	30	195.0	121.9	90	245.9	153.7
51	43.2	27.0	111	94.1	58.8	171	145.0	90.6	231	195.9	122.4	291	246.8	154.2
52	44.1	27.6	12	95.0	59.4	72	145.9	91.2	32	196.7	123.0	92	247.6	154.8
53	44.9	28.1	13	95.8	59.9	73	146.7	91.7	33	197.6	123.5	93	248.5	155.3
54	45.8	28.6	14	96.7	60.4	74	147.6	92.2	34	198.4	124.0	94	249.3	155.8
55	46.6	29.2	15	97.5	61.0	75	148.4	92.8	35	199.3	124.6	95	250.2	156.4
56	47.5	29.7	16	98.4	61.5	76	149.2	93.3	36	200.1	125.1	96	251.0	156.9
57	48.3	30.2	17	99.2	62.0	77	150.1	93.8	37	201.0	125.6	97	251.9	157.4
58	49.2	30.7	18	100.1	62.5	78	150.9	94.3	38	201.8	126.1	98	252.7	157.9
59	50.0	31.3	19	100.9	63.1	79	151.8	94.9	39	202.7	126.7	99	253.6	158.5
60	50.9	31.8	120	101.8	63.6	180	152.6	95.4	240	203.5	127.2	300	254.4	159.0
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 23 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.5	61	51.2	33.2	121	101.5	65.9	181	151.8	98.6	241	202.1	131.2
2	01.7	01.1	62	52.0	33.8	22	102.3	66.4	82	152.6	99.1	42	202.9	131.8
3	02.5	01.6	63	52.8	34.3	23	103.1	67.0	83	153.5	99.7	43	203.8	132.3
4	03.4	02.2	64	53.7	34.9	24	104.0	67.5	84	154.3	100.2	44	204.6	132.9
5	04.2	02.7	65	54.5	35.4	25	104.8	68.1	85	155.1	100.8	45	205.5	133.4
6	05.0	03.3	66	55.3	35.9	26	105.7	68.6	86	156.0	101.3	46	206.3	134.0
7	05.9	03.8	67	56.2	36.5	27	106.5	69.2	87	156.8	101.8	47	207.1	134.5
8	06.7	04.4	68	57.0	37.0	28	107.3	69.7	88	157.7	102.4	48	208.0	135.1
9	07.5	04.9	69	57.9	37.6	29	108.2	70.3	89	158.5	102.9	49	208.8	135.6
10	08.4	05.4	70	58.7	38.1	30	109.0	70.8	90	159.3	103.5	50	209.7	136.2
11	09.2	06.0	71	59.5	38.7	131	109.9	71.3	191	160.2	104.0	251	210.5	136.7
12	10.1	06.5	72	60.4	39.2	32	110.7	71.9	92	161.0	104.6	52	211.3	137.2
13	10 9	07.1	73	61.2	39.8	33	111.5	72.4	93	161.8	105.1	53	212.2	137.8
14	11.7	07.6	74	62.1	40.3	34	112.4	73.0	94	162.7	105.7	54	213.0	138.3
15	12.6	08.2	75	62.9	40.8	35	113.2	73.5	95	163.5	106.2	55	213.8	138.9
16	13.4	08.7	76	63.7	41.4	36	114.0	74.1	96	164.4	106.7	56	214.7	139.4
17	14.3	09.3	77	64.6	41.9	37	114.9	74.6	97	165.2	107.3	57	215.5	140.0
18	15.1	09.8	78	65.4	42.5	38	115.7	75.2	98	166.0	107.8	58	216.4	140.5
19	15.9	10.3	79	66.2	43.0	39	116.6	75.7	99	166.9	108.4	59	217.2	141.1
20	16.8	10.9	80	67.1	43.6	40	117.4	76.2	200	167.7	108.9	60	218.0	141.6
21	17.6	11.4	81	67.9	44.1	141	118.2	76.8	201	168.6	109.5	261	218.9	142.1
22	18.4	12.0	82	68.8	44.7	42	119.1	77.3	02	169.4	110.0	62	219.7	142.7
23	19.3	12.5	83	69.6	45.2	43	119.9	77.9	03	170.2	110.6	63	220.6	143.2
24	20.1	13.1	84	70.4	45.7	44	120.8	78.4	04	171.1	111.1	64	221.4	143.8
25	21.0	13.6	85	71.3	46.3	45	121.6	79.0	05	171.9	111.6	65	222.2	143.3
26	21.8	14.2	86	72.1	46.8	46	122.4	79.5	06	172.8	112.2	66	223.1	144.9
27	22.6	14.7	87	73.0	47.4	47	123.3	80.1	07	173.6	112.7	67	223.9	145.4
28	23.5	15.2	88	73.8	47.9	48	124.1	80.6	08	174.4	113.3	68	224.7	146.0
29	24.3	15.8	89	74.6	48.5	49	125.0	81.1	09	175.3	113.8	69	225.6	146.5
30	25.2	16.3	90	75.5	49.0	50	125.8	81.7	10	176.1	114.4	70	226.4	147.1
31	26.0	16.9	91	76.3	49.6	151	126.6	82.2	211	176.9	114.9	271	227.3	147.6
32	26.8	17.4	92	77.2	50.1	52	127.5	82.8	12	177.8	115.5	72	228.1	148.1
33	27.7	18.0	93	78.0	50.6	53	128.3	83.3	13	178.6	116.0	73	228.9	148.7
34	28.5	18.5	94	78.8	51.2	54	129.1	83.9	14	179.5	116.5	74	229.8	149.2
35	29.4	19.1	95	79.7	51.7	55	130.0	84.4	15	180.3	117.1	75	230.6	149.8
36	30.2	19.6	96	80.5	52.3	56	130.8	85.0	16	181.1	117.6	76	231.5	150.3
37	31.0	20.2	97	81.3	52.8	57	131.7	85.5	17	182.0	118.2	77	232.3	150.9
38	31.9	20 7	98	82.2	53 4	58	132.5	86.0	18	182.8	118.7	78	233.1	151.4
39	32.7	21.2	99	83.0	53.9	59	133.3	86.6	19	183.7	119.3	79	234.0	151.9
40	33.5	21.8	100	83.9	54.5	60	134.2	87 1	20	184.5	119.8	80	234.8	152.3
41	34.4	22.3	101	84.7	55.0	161	135.0	87.7	221	185.3	120.4	281	235.6	153.0
42	35.2	22.9	02	85.5	55.5	62	135.9	88 2	22	186.2	120.9	82	236.5	153.6
43	36.1	23.4	03	86.4	6.1	63	136.7	88.8	23	187.0	121.4	83	237.3	154.1
44	36.9	24.0	04	87.2	56.6	64	137.5	89.3	24	187.8	122.0	84	238.2	154.7
45	37.7	24.5	05	88.1	57.2	65	138.4	89.9	25	188.7	122.5	85	239.0	155.2
46	38.6	25.1	06	88.9	57.7	66	139.2	90.4	26	189.5	123.1	86	239.8	155 8
47	39.4	25.6	07	89.7	58.3	67	140.0	90.9	27	190.4	123.6	87	240.7	156.3
48	40.3	26.1	08	90.6	58.8	68	140.9	91 5	28	191.2	124.2	88	241.5	156.8
49	41.1	26.7	09	91.4	59.4	69	141.7	92.0	29	192.0	124.7	89	242.4	157.4
50	41.9	27.2	10	92.2	59.9	70	142.6	92.6	30	192.9	125.3	90	243.2	157.9
51	42.8	27.8	111	93.1	60.5	171	143.4	93.1	231	193.7	125.8	291	244.0	158.5
52	43.6	28.3	12	93.9	61.0	72	144 2	93.7	32	194.6	126.3	92	244.9	159.0
53	44.4	28.9	13	94 8	61.5	73	145.1	94.2	33	195.4	126.9	93	245.7	159.6
54	45.3	29.4	14	95.6	62.1	74	145.9	94.8	34	196.2	127.4	94	246.5	160.1
55	46.1	30.0	15	96.4	62.6	75	146.8	95.3	35	197.1	128.0	95	247 4	160.7
56	47.0	30.5	16	97.3	63.2	76	147.6	95.8	36	197.9	128.5	96	248.2	161.2
57	47.8	31.0	17	98.1	63.7	77	148.4	96.4	37	198.7	129.1	97	249.1	161.7
58	48.6	31.6	18	99.0	64.3	78	149.3	96.9	38	199.6	129.6	98	249.9	162.3
59	49.5	32.1	19	99 8	64.8	79	150.1	97.5	39	200.4	130.2	99	250.7	162 8
60	50.4	32.7	120	10 .6	65.4	180	150.9	98.0	240	201.3	130.7	300	251.6	163.4
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 34 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	50.6	34.1	121	100.3	67.7	181	150.0	101.2	241	199.8	134.8
2	01.7	01.1	62	51.4	34.7	22	101.1	68.2	82	150.9	101.8	42	200.6	135.3
3	02.5	01.7	63	52.2	35.2	23	102.0	68.8	83	151.7	102.3	43	201.4	135.9
4	03.3	02.2	64	53.1	35.8	2	102.8	69.3	84	152.5	102.9	44	202.3	136.4
5	04.1	02.8	65	53.9	36.3	25	103.6	69.9	85	153.4	103.5	45	203.1	137.0
6	05.0	03.4	66	54.7	36.9	26	104.5	70.5	86	154.2	104.0	46	203.9	137.6
7	05.8	03.9	67	55.5	37.5	27	105.3	71.0	87	155.0	104.6	47	204.8	138.1
8	06.6	04.5	68	56.4	38.0	28	106.1	71.6	88	155.9	105.1	48	205.6	138.7
9	07.5	05.0	69	57.2	38.6	29	106.9	72.1	89	156.7	105.7	49	206.4	139.2
10	08.3	05.6	70	58.0	39.1	30	107.8	72.7	90	157.5	106.2	50	207.3	139.8
11	09.1	06.2	71	58.9	39.7	131	108.6	73.3	191	158.3	106.8	251	208.1	140.4
12	09.9	06.7	72	59.7	40.3	32	109.4	73.8	92	159.2	107.4	52	208.9	140.9
13	10.8	07.3	73	60.5	40.8	33	110.3	74.4	93	160.0	107.9	53	209.7	141.5
14	11.6	07.8	74	61.3	41.4	34	111.1	74.9	94	160.8	108.5	54	210.6	142.0
15	12.4	08.4	75	62.2	41.9	35	111.9	75.5	95	161.7	109.0	55	211.4	142.6
16	13.3	08.9	76	63.0	42.5	36	112.7	76.1	96	162.5	109.6	56	212.2	143.2
17	14.1	09.5	77	63.8	43.1	37	113.6	76.6	97	163.3	110.2	57	213.1	143.7
18	14.9	10.1	78	64.7	43.6	38	114.4	77.2	98	164.1	110.7	58	213.9	144.3
19	15.8	10.6	79	65.5	44.2	39	115.2	77.7	99	165.0	111.3	59	214.7	144.8
20	16.6	11.2	80	66.3	44.7	40	116.1	78.3	200	165.8	111.8	60	215.5	145.4
21	17.4	11.7	81	67.1	45.3	141	116.9	78.8	201	166.6	112.4	261	216.4	146.0
22	18.2	12.3	82	68.0	45.9	42	117.7	79.4	02	167.5	113.0	62	217.2	146.5
23	19 1	12.9	83	68.8	46.4	43	118.5	80.0	03	168.3	113.5	63	218.0	147.1
24	19.9	13.4	84	69.6	47.0	44	119.4	80.5	04	169.1	114.1	64	218.9	147.6
25	20.7	14.0	85	70.5	47.5	45	120.2	81.1	05	169.9	114.6	65	219.7	148.2
26	21.6	14.5	86	71.3	48.1	46	121.0	81.6	06	170.8	115.2	66	220.5	148.7
27	22.4	15.1	87	72.1	48.7	47	121.9	82.2	07	171.6	115.8	67	221.3	149.3
28	23.2	15.7	88	73.0	49.2	48	122.7	82.8	08	172.4	116.3	68	222.2	149.9
29	24.0	16.2	89	73.8	49.8	49	123.5	83.3	09	173.3	116.9	69	223.0	150.4
30	24.9	16.8	90	74.6	50.3	50	124.4	83.9	10	174.1	117.4	70	223.8	151.0
31	25.7	17.3	91	75.4	50.9	151	125.2	84.4	211	174.9	118.0	271	224.7	151.5
32	26.5	17.9	92	76.3	51.4	52	126.0	85.0	12	175.7	118.6	72	225.5	152.1
33	27.4	18.5	93	77.1	52.0	53	126.8	85.6	13	176.6	119 1	73	226.3	152.7
34	28.2	19.0	94	77.9	52.6	54	127.7	86.1	14	177.4	119.7	74	227.1	153.2
35	29.0	19.6	95	78.8	53.1	55	128.5	86.7	15	178.2	120.2	75	228.0	153.8
36	29.8	20.1	96	79.6	53.7	56	129.3	87.0	16	179.1	120.8	76	228.8	154.3
37	30.7	20.7	97	80.4	54.2	57	130.2	87.8	17	179.9	121.3	77	229.6	154.9
38	31.5	21.2	98	81.2	54.8	58	131.0	88.4	18	180.7	121.9	78	230.5	155.5
39	32.3	21.8	99	82.1	55.4	59	131.8	88.9	19	181.6	122.5	79	231.3	156.0
40	33.2	22.4	100	82.0	55.9	60	132.6	89.5	20	182.4	123.0	80	232.1	156.6
41	34.0	22.8	101	83.8	56.5	161	133.5	90.0	221	183.2	123.6	281	232.9	157.1
42	34.8	23.5	02	84.6	57.0	62	134.3	90.6	22	184.0	124.1	82	233.8	157.7
43	35.6	24.0	03	85.4	57.6	63	135.1	91.1	23	184.9	124.7	83	234.6	158.3
44	36.5	24.6	04	86.2	58.2	64	136.0	91.7	24	185.7	125.3	84	235.4	158.8
45	37.3	25.2	05	87.0	58.7	65	136.8	92.3	25	186.5	125.8	85	236.3	159.4
46	38.1	25.7	06	87.9	59.3	66	137.6	92.8	26	187.4	126.4	86	237.1	159.9
47	39.0	26.3	07	88.7	59.8	67	138.4	93.4	27	188.2	126.9	87	237.9	160.5
48	39.8	26.8	08	89.5	60.4	68	139.3	93.9	28	189.0	127.5	88	238.8	161.0
49	40.6	27.4	09	90.4	61.0	69	140.1	94.5	29	189.8	128.1	89	239.6	161.6
50	41.5	28.0	10	91.2	61.5	70	140.9	95.1	30	100.7	128.6	90	240.4	162.2
51	42.3	28.5	111	92.0	62.1	171	141.8	95.6	231	191.5	129.2	291	241.2	162.7
52	43.1	29.1	12	92.8	62.6	72	142.6	96.2	32	192.3	129.7	92	242.1	163.3
53	43.9	29.6	13	93.7	63.2	73	143.4	96.7	33	193.2	130.3	93	242.9	163.8
54	44.8	30.2	14	94.5	63.7	74	144.2	97.3	34	194.0	130.9	94	243.7	164.4
55	45.6	30.8	15	95.3	64.3	75	145.1	97.9	35	194.8	131.4	95	244.6	165.0
56	46.4	31.3	16	96.2	64.9	76	145.9	98.4	36	195.6	132.0	96	245.4	165.6
57	47.3	31.9	17	97.0	65.4	77	146.7	99.0	37	196.5	132.5	97	246.2	166.1
58	48.1	32 4	18	97.8	66.0	78	147.6	99.5	38	197.3	133.1	98	247.0	166.6
59	48.9	33.0	19	98.7	66.5	79	148.4	100.1	39	198.1	133.6	99	247.9	167.2
60	49.7	33.6	120	99.5	67.1	180	149.2	100.7	240	199.0	134.2	300	248 7	167.8
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 56 Degrees.

TABLE III. Difference of Latitude and Departure for 35 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	50.0	35.0	121	99.1	69.4	181	148.2	103.8	241	197.4	138.2
2	01.6	01.1	62	50.8	35.6	22	99.9	70.0	82	149.1	104.4	42	198.2	138.8
3	02.5	01.7	63	51.6	36.1	23	100.7	70.5	83	149.9	105.0	43	199.0	139.4
4	03.3	02.3	64	52.4	36.7	24	101.6	71.1	84	150.7	105.5	44	199.8	139.9
5	04.1	02.9	65	53.2	37.3	25	102.4	71.7	85	151.5	106.1	45	200.6	140.5
6	04.9	03.4	66	54.1	37.9	26	103.2	72.3	86	152.3	106.7	46	201.5	141.1
7	05.7	04.0	67	54.9	38.4	27	104.0	72.8	87	153.1	107.2	47	202.3	141.7
8	06.6	04.6	68	55.7	39.0	28	104.8	73.4	88	154.0	107.8	48	203.1	142.2
9	07.4	05.2	69	56.5	39.6	29	105.6	74.0	89	154.8	108.4	49	203.9	142.8
10	08.2	05.7	70	57.3	40.1	30	106.5	74.6	90	155.6	109.0	50	204.7	143.4
11	09.0	06.3	71	58.1	40.7	131	107.3	75.1	191	156.4	109.5	251	205.6	143.9
12	09.8	06.9	72	59.0	41.3	32	108.1	75.7	92	157.2	110.1	52	206.4	144.5
13	10.6	07.5	73	59.8	41.9	33	108.9	76.3	93	158.1	110.7	53	207.2	145.1
14	11.5	08.0	74	60.6	42.4	34	109.7	76.8	94	158.9	111.3	54	208.0	145.7
15	12.3	08.6	75	61.4	43.0	35	110.6	77.4	95	159.7	111.8	55	208.8	146.2
16	13.1	09.2	76	62.2	43.6	36	111.4	78.0	96	160.5	112.4	56	209.6	146.8
17	13.9	09.7	77	63.1	44.2	37	112.2	78.6	97	161.3	113.0	57	210.5	147.4
18	14.7	10.3	78	63.9	44.7	38	113.0	79.1	98	162.2	113.6	58	211.3	148.0
19	15.6	10.9	79	64.7	45.3	39	113.8	79.7	99	163.0	114.1	59	212.1	148.5
20	16.4	11.5	80	65.5	45.9	40	114.6	80.3	200	163.8	114.7	60	212.9	149.1
21	17.2	12.0	81	66.3	46.5	141	115.5	80.9	201	164.6	115.3	261	213.8	149.7
22	18.0	12.6	82	67.2	47.0	42	116.3	81.4	02	165.4	115.8	62	214.6	150.3
23	18.8	13.2	83	68.0	47.6	43	117.1	82.0	03	166.3	116.4	63	215.4	150.8
24	19.6	13.8	84	68.8	48.2	44	117.9	82.6	04	167.1	117.0	64	216.2	151.4
25	20.5	14.3	85	69.6	48.7	45	118.8	83.2	05	167.9	117.6	65	217.0	152.0
26	21.3	14.9	86	70.4	49.3	46	119.6	83.7	06	168.6	118.1	66	117.8	152.6
27	22.1	15.5	87	71.3	49.9	47	120.4	84.3	07	169.5	118.7	67	218.7	153.1
28	22.9	16.1	88	72.1	50.5	48	121.2	84.9	08	170.3	119.3	68	219.5	153.7
29	23.8	16.6	89	72.9	51.0	49	122.0	85.5	09	171.2	119.5	69	220.3	154.3
30	24.6	17.2	90	73.7	51.6	50	122.8	86.0	10	172.0	120.4	70	221.1	154.8
31	25.4	17.8	91	74.5	52.2	151	123.7	86.6	211	172.8	121.0	271	221.9	155.4
32	26.2	18.4	92	75.3	52.8	52	124.5	87.2	12	173.6	121.6	72	222.8	156.0
33	27.0	18.9	93	76.2	53.3	53	125.3	87.7	13	174.4	122.2	73	223.6	156.6
34	27.8	19.5	94	77.0	53.9	54	126.1	88.3	14	175.3	122.7	74	224.4	157.1
35	28.7	20.1	95	77.8	54.5	55	126.9	88.9	15	176.1	123.3	75	225.2	157.7
36	29.5	20.6	96	78.6	55.1	56	127.8	89.5	16	176.9	123.9	76	226.0	158.3
37	30.3	21.2	97	79.4	55.6	57	128.6	90.0	17	177.7	124.4	77	226.9	158.9
38	31.1	21.8	98	80.3	56.2	58	129.4	90.6	18	178.5	125.0	78	227.7	159.4
39	31.9	22.4	99	81.1	56.8	59	130.2	91.2	19	179.4	125.6	79	228.5	160.0
40	32.8	22.9	100	81.9	57.4	60	131.0	91.8	20	180.2	126.2	80	229.3	160.6
41	33.6	23.5	101	82.7	57.9	161	131.9	92.3	221	181.0	126.7	281	230.1	161.2
42	34.4	24.1	02	83.5	58.5	62	132.7	92.9	22	181.8	127.3	82	231.0	161.7
43	35.2	24.7	03	84.4	59.1	63	133.5	93.5	23	182.6	127.9	83	231.8	162.3
44	36.0	25.2	04	85.2	59.6	64	134.3	94.1	24	183.5	128.5	84	232.6	162.9
45	36.9	25.8	05	86.0	60.2	65	135.1	94.6	25	184.2	129.0	85	233.4	163.4
46	37.7	26.4	06	86.8	60.8	66	136.0	95.2	26	185.1	129.6	86	234.2	164.0
47	38.5	27.0	07	87.6	61.4	67	136.8	95.8	27	185.9	130.2	87	235.0	164.6
48	39.3	27.5	08	88.5	61.9	68	137.6	96.3	28	186.7	130.8	88	235.9	165.2
49	40.1	28 1	09	89.3	62.5	69	138.4	96.9	29	187.5	131.3	89	236.7	165.7
50	41.0	28.7	10	90.1	63.1	70	139.2	97.5	30	188.4	131.9	90	237.5	166.3
51	41.8	29.2	111	90.9	63.7	171	140.0	98.1	231	189.2	132.5	291	238.3	166.9
52	42.6	29.8	12	91.7	64.2	72	140.9	98.6	32	190.0	133.1	92	239.1	167.5
53	43.4	30.4	13	92.5	64.8	73	141.7	99.2	33	190.8	133.6	93	240.0	168.0
54	44.2	31.0	14	93.4	65.4	74	142.5	99.8	34	191.6	134.2	94	240.8	168.6
55	45.0	31.5	15	94.2	66.0	75	143.3	100.4	35	192.5	134.8	95	241.6	169.2
56	45.9	32.1	16	95.0	66.5	76	144.1	100.9	36	193.3	135.3	96	242.4	169.8
57	46.7	32 7	17	95.8	67.1	77	145.0	101.5	37	194.1	135.9	97	243.2	170.3
58	47.5	33.3	18	96.6	67.7	78	145.8	102.1	38	194.9	136.5	98	244.1	170.9
59	48.3	33.8	19	97.5	68.2	79	146.6	102.7	39	195.7	137.1	99	244.9	171.5
60	49.1	34.4	120	98.3	68.8	180	147.4	103.2	240	196.6	137.6	300	245.7	172.1
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 36 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	49.3	35.9	121	97.9	71.1	181	146.4	106 4	241	195.0	141.7
2	01.6	01.2	62	50.2	36.4	22	98.7	71.7	82	147.2	107.0	42	195.8	142.2
3	02.4	01.8	63	51.0	37.0	23	99.5	72.3	83	148.0	107.6	43	196.6	142.8
4	03.2	02.4	64	51.8	37.6	24	100.3	72.9	84	148.9	108.2	44	197.4	143.4
5	04.0	02.9	65	52.6	38.2	25	101.1	73.5	85	149.7	108.7	45	198.2	144.0
6	04.9	03.5	66	53.4	38.8	26	101.9	74.1	86	150.5	109.3	46	199.0	144.6
7	05.7	04.1	67	54.2	39.4	27	102.7	74 7	87	151.3	109.9	47	199.8	145 2
8	06.5	04.7	68	55.0	40 0	28	103.6	75 2	88	152.1	110 5	48	200.6	145.8
9	07.3	05.3	69	55.8	40.6	29	104 4	75.8	89	152.9	111.1	49	201.4	146.4
10	08.1	05.9	70	56.6	41.1	30	105 2	76.4	90	153.7	111.7	50	202.2	146.9
11	08.9	06.5	71	57.4	41.7	131	106 0	77.0	191	154.5	112.3	251	203.1	147.5
12	09.7	07.1	72	58.2	42.3	32	106.8	77.6	92	155.3	112.9	52	203.9	148.1
13	10.5	07.6	73	59.1	42.9	33	107.6	78.2	93	156.1	113.4	53	204.7	148.7
14	11.3	08.2	74	59.9	43.5	34	108.4	78.8	94	156.9	114.0	54	205.5	149.3
15	12.1	08.8	75	60 7	44.1	35	109.2	79.4	95	157.8	114.6	55	206.3	149.9
16	12.9	09.4	76	61.5	44.7	36	110.0	79.9	96	158.6	115.2	56	207.1	150.5
17	13.8	10.0	77	62.3	45.3	37	110.8	80.5	97	159.4	115.8	57	207.9	151.1
18	14.6	10.6	78	63.1	45.8	38	111.6	81.1	98	160.2	116.4	58	208.7	151.7
19	15.4	11.2	79	63.9	46.4	39	112.5	81.7	99	161.0	117 0	59	209 5	152.2
20	16.2	11.8	80	64.7	47.0	40	113.3	82.3	200	161.8	117.6	60	210 3	152.8
21	17.0	12.3	81	65.5	47.6	141	114.1	82.9	201	162.6	118.1	261	211.1	153.4
22	17.8	12.9	82	66.3	48.2	42	114.9	83.5	02	163.4	118.7	62	212.0	154.0
23	18.6	13.5	83	67.1	48.8	43	115.7	84.1	03	164.2	119.3	63	212.8	154.6
24	19.4	14.1	84	68.0	49.4	44	116.5	84.6	04	165.0	119.9	64	213.6	155.2
25	20.2	14.7	85	68.8	50.0	45	117.3	85.2	05	165.8	120.5	65	214.4	155.8
26	21.0	15.3	86	69.6	50.6	46	118.1	85.8	06	166.7	121.1	66	215.2	156 4
27	21.8	15.9	87	70.4	51 1	47	118.9	86.4	07	167.5	121.7	67	216.0	156.9
28	22.7	16.5	88	71.2	51 7	48	119.7	87.0	08	168 3	122.3	68	216.8	157.5
29	23.5	17.0	89	72.0	52.3	49	120.5	87.6	09	169.1	122.8	69	217.6	158.1
30	24.3	17.6	90	72.8	52.9	50	121.3	88.2	10	169.9	123.4	70	218.4	158.7
31	25.1	18.2	91	73.6	53.5	151	122.2	88.8	211	170.7	124.0	271	219.2	159.5
32	25.9	18.8	92	74.4	54 1	52	123.0	89.3	12	171.5	124.6	72	220.0	159.9
33	26.7	19.4	93	75.2	54.7	53	123.8	89.9	13	172.3	125.2	73	220.9	160.5
34	27.5	20.0	94	76.0	55.3	54	124.6	90.5	14	173.1	125.8	74	221.7	161.1
35	28.3	20.6	95	76.9	55.8	55	125.4	91.1	15	173.9	126.4	75	222.5	161.6
36	29.1	21.2	96	77.7	56.4	56	126.2	91.7	16	174.7	127.0	76	223.3	162 2
37	29.9	21.7	97	78.5	57.0	57	127.0	92.3	17	175.6	127.6	77	224.1	162.8
38	30.7	22.3	98	79.3	57.6	58	127.8	92.9	18	176.4	128.1	78	224.9	163.4
39	31.6	22.9	99	80.1	58.2	59	128.6	93.5	19	177.2	128.7	79	225.7	164.0
40	32.4	23.5	100	80.9	58.8	60	129.4	94.0	20	178.0	129.3	80	226.5	164.6
41	33.2	24.1	101	81.7	59.4	161	130.2	94.6	221	178.8	129.9	281	227.3	165.2
42	34.0	24.7	02	82.5	60.0	62	131.1	95.2	22	179.6	130.5	82	228.1	165.8
43	34.8	25.3	03	83.3	60.5	63	131.9	95.8	23	180.4	131.1	83	228.9	166.3
44	35.6	25.9	04	84.1	61.1	64	132.7	96.4	24	181.2	131.7	84	229.8	166.9
45	36.4	26.5	05	84.9	61.7	65	133.5	97.0	25	182.0	132.3	85	230.6	167.5
46	37.2	27.1	06	85.8	62.3	66	134.3	97.6	26	182.8	132.8	86	231.4	168.1
47	38.0	27.6	07	86.6	62.9	67	135.1	98 2	27	183.6	133.4	87	232.2	168.7
48	38.8	28.2	08	87.4	63.5	68	135.9	98.7	28	184.5	134.0	88	233.0	169.3
49	39.6	28.8	09	88.2	64.1	69	136.7	99.3	29	185.3	134.6	89	233.8	169.9
50	40.5	29.4	10	89.0	64.7	70	137.5	99 9	30	186.1	135 2	90	234.6	170.5
51	41.3	30.0	111	89.8	65.2	171	138.3	100.5	231	186.9	135.8	291	235.4	171.0
52	42.1	30.6	12	90.6	65.8	72	139.1	101.1	32	187.7	136.4	92	236.2	171.6
53	42.9	31.2	13	91.4	66.4	73	140.0	101.7	33	188.5	137.0	93	237.0	172.2
54	43.7	31.7	14	92.2	67.0	74	140.8	102.3	34	189.3	137.5	94	237.8	172.8
55	44.5	32.3	15	93.0	67.6	75	141.6	102.9	35	190.1	138.1	95	238.7	173.4
56	45.3	32.9	16	93.8	68.2	76	142.4	103.5	36	190.9	138.7	96	239.5	174.0
57	46.1	33.5	17	94.7	68.8	77	143.2	104.0	37	191.7	139.3	97	240.3	174.6
58	46.9	34.1	18	95.5	69.4	78	144.0	104.6	38	192.5	139.9	98	241.1	175.2
59	47.7	34.7	19	96.3	69.9	79	144.8	105.2	39	193.3	140.5	99	241.9	175.7
60	48.5	35.3	120	97.1	70.5	180	145.6	105.8	240	194.2	141.1	300	242.7	176.3
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 54 Degrees.

Table III. Difference of Latitude and Departure for 37 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	48.7	36.7	121	96.6	72.8	181	144.5	108.9	241	192.5	145.0
2	01.6	01.2	62	49.5	37.3	22	97.4	73.4	82	145.3	109.5	42	193.3	145.6
3	02.4	01.8	63	50.3	37.9	23	98.2	74.0	83	146.1	110.1	43	194.1	146.2
4	03.2	02.4	64	51.1	38.5	24	99.0	74.6	84	146.9	110.7	44	194.9	146.8
5	04.0	03.0	65	51.9	39.1	25	99.8	75.2	85	147.7	111.3	45	195.7	147.4
6	04.8	03.6	66	52.7	39.7	26	100.6	75.8	86	148.5	111.9	46	196.5	148.0
7	05.6	04.2	67	53.5	40.3	27	101.4	76.4	87	149.3	112.5	47	197.3	148.6
8	06.4	04.8	68	54.3	40.9	28	102.2	77.0	88	150.1	113.1	48	198.1	149.2
9	07.2	05.4	69	55.1	41.5	29	103.0	77.6	89	150.9	113.7	49	198.9	149.8
10	08.0	06.0	70	55.9	42.1	30	103.8	78.2	90	151.7	114.3	50	199.7	150.4
11	08.8	06.6	71	56.7	42.7	131	104.6	78.8	191	152.5	114.9	251	200.4	151.0
12	09.6	07.2	72	57.5	43.3	32	105.4	79.4	92	153.3	115.5	52	201.2	151.6
13	10.4	07.8	73	58.3	43.9	33	106.2	80.0	93	154.1	116.1	53	202.0	152.2
14	11.2	08.4	74	59.1	44.5	34	107.0	80.6	94	154.9	116.7	54	202.8	152.9
15	12.0	09.0	75	59.9	45.1	35	107.8	81.2	95	155.7	117.3	55	203.6	153.5
16	12.8	09.6	76	60.7	45.7	36	108.6	81.8	96	156.5	117.9	56	204.4	154.1
17	13.6	10.2	77	61.5	46.3	37	109.4	82.4	97	157.3	118.6	57	205.2	154.7
18	14.4	10.8	78	62.3	46.9	38	110.2	83.0	98	158.1	119.2	58	206.0	155.3
19	15.2	11.4	79	63.1	47.5	39	111.0	83.6	99	158.9	119.8	59	206.8	155.9
20	16.0	12.0	80	63.9	48.1	40	111.8	84.2	200	159.7	120.4	60	207.6	156.5
21	16.8	12.6	81	64.7	48.7	141	112.6	84.9	201	160.5	121.0	261	208.4	157.1
22	17.6	13.2	82	65.5	49.3	42	113.4	85.5	02	161.3	121.6	62	209.2	157.7
23	18.4	13.8	83	66.3	49.9	43	114.2	86 1	03	162.1	122.2	63	210.0	158.3
24	19.2	14.4	84	67.1	50.6	44	115.0	86.7	04	162.9	122.8	64	210.8	158.9
25	20.0	15.0	85	67.9	51.2	45	115.8	87.3	05	163.7	123.4	65	211.6	159.5
26	20.8	15.6	86	68.7	51.8	46	116.6	87.9	06	164.5	124.0	66	212.4	160.1
27	21.6	16.2	87	69.5	52.4	47	117.4	88.5	07	165.3	124.6	67	213.2	160.7
28	22.4	16.9	88	70.3	53.0	48	118.2	89.1	08	166.1	125.2	68	214.0	161.3
29	23.2	17.5	89	71.1	53.6	49	119.0	89 7	09	166.9	125.8	69	214.8	161.9
30	24.0	18.1	90	71.9	54.2	50	119.8	90.3	10	167.7	126.4	70	215.6	162 5
31	24.8	18.7	91	72.7	54.8	151	120.6	90.9	211	168.5	127.0	271	216.4	163.1
32	25.6	19.3	92	73.5	55.4	52	121.4	91.5	12	169.3	127.6	72	217.2	163.7
33	26.4	19.9	93	74.3	56.0	53	122.2	92.1	13	170.1	128.2	73	218.0	164.3
34	27.2	20.5	94	75.1	56.6	54	123.0	92.7	14	170.9	128.8	74	218.8	164.9
35	28.0	21.1	95	75.9	57.2	55	123.8	93.3	15	171.7	129.4	75	219.6	165.5
36	28.7	21.7	96	76.7	57.8	56	124.6	93.9	16	172.5	130.0	76	220.4	166.1
37	29.5	22.3	97	77.5	58.4	57	125.4	94.5	17	173.3	130.6	77	221.2	166.7
38	30.3	22.9	98	78.3	59.0	58	126.2	95.1	18	174.1	131.2	78	222.0	167.3
39	31.1	23.5	99	79.1	59.6	59	127.0	95.7	19	174.9	131.8	79	222.8	167.9
40	31.9	24.1	100	79.9	60 2	60	127.8	96.3	20	175.7	132.4	80	223.6	168.5
41	32.7	24.7	101	80.7	60.8	161	128.6	96.9	221	176.5	133.0	281	224.4	169.1
42	33.5	25.3	02	81.5	61.4	62	129.4	97.5	22	177.3	133.6	82	225.2	169.7
43	34.3	25.9	03	82.3	62.0	63	130.2	98.1	23	178.1	134.2	83	226.0	170.3
44	35.1	26.5	04	83.1	62.6	64	131.0	98.7	24	178.9	134.8	84	226.8	170.9
45	35.9	27.1	05	83.9	63.2	65	131.8	99.3	25	179.7	135.4	85	227.6	171.5
46	36.7	27.7	06	84.7	63.8	66	132.6	99.9	26	180.5	136.0	86	228.4	172.1
47	37.5	28.3	07	85.5	64.4	67	133.4	100.5	27	181.3	136.6	87	229.2	172.7
48	38.3	28.9	08	86.2	65.0	68	134.2	101.1	28	182.1	137.2	88	230.0	173.3
49	39.1	29.5	09	87.0	65.6	69	135.0	101.7	29	182.9	137.8	89	230.8	173.9
50	39.9	30.1	10	87.8	66.2	70	135.8	102.3	30	183.7	138.4	90	231.6	174.5
51	40.7	30.7	111	88.6	66.8	171	136.6	102.9	231	184.5	139.0	291	232.4	175.1
52	41.5	31.3	12	89.4	67.4	72	137.4	103.5	32	185.3	139.6	92	233.2	175.7
53	42.3	31.9	13	90.2	68.0	73	138.2	104.1	33	186.1	140.2	93	234.0	176.3
54	43.1	32.5	14	91.0	68.6	74	139.0	104.7	34	186.9	140 8	94	234.8	176.9
55	43.9	33.1	15	91.8	69.2	75	139.8	105.3	35	187.7	141.4	95	235.6	177.5
56	44.7	33.7	16	92.6	69.8	76	140.6	105.9	36	188.5	142.0	96	236.4	178.1
57	45.5	34.3	17	93.4	70.4	77	141.4	106.5	37	189.3	142.6	97	237.2	178.7
58	46.3	34.9	18	94.2	71.0	78	142.2	107.1	38	190.1	143.2	98	238.0	179.3
59	47.1	35.5	19	95.0	71.6	79	142.9	107.7	39	190.9	143.8	99	238.8	179.9
60	47.9	36.1	120	95.8	72.2	180	143.7	108.3	240	191.7	144.4	300	239.6	180.5
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 53 Degrees.

TABLE III. Difference of Latitude and Departure for 38 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat	Dep.	Dist	Lat.	Dep	Dist	Lat.	Dep.
1	00.8	00.6	61	48.1	37.6	121	95.3	74.5	181	142.6	111.4	241	189.9	148.4
2	01.6	01.2	62	48.9	38.2	22	96.1	75.1	82	143.4	112.1	42	190.7	149.0
3	02.4	01.8	63	49.6	38.8	23	96.9	75.7	83	144.2	112.7	43	191.5	149.6
4	03.2	02.5	64	50.4	39.4	24	97.7	76.3	84	145.0	113.3	44	192.2	150.2
5	03.9	03.1	65	51.2	40.0	25	98.5	77.0	85	145 8	113.9	45	193.0	150.8
6	04.7	03.7	66	52.0	40.6	26	99.3	77.6	86	146.5	114.5	46	193.8	151.5
7	05.5	04.3	67	52.8	41.3	27	100.1	78.2	87	147.3	115.1	47	194.6	152.1
8	06.3	04.9	68	53.6	41.9	28	100.9	78.8	88	148.1	115.8	48	195.4	152.7
9	07.1	05.5	69	54.4	42.5	29	101.6	79.4	89	148.9	116.4	49	196.2	153.3
10	07.9	06 2	70	55.2	43.1	30	102.4	80.0	90	149.7	117.0	50	197.0	153.9
11	08.7	06.8	71	55.9	43.7	131	103.2	80.7	191	150.5	117.6	251	197.8	154.5
12	09.5	07.4	72	56.7	44.3	32	104.0	81.3	92	151.3	118.2	52	198.5	155.2
13	10.2	08.0	73	57.5	44.9	33	104.8	81.9	93	152.1	118.8	53	199.3	155.8
14	11.0	08.6	74	58.3	45.6	34	105.6	82.5	94	152.9	119.4	54	200.1	156.4
15	11.8	09.2	75	59.1	46.2	35	106.4	83.1	95	153.6	120.1	55	200.9	157.0
16	12.6	09.9	76	59.9	46.8	36	107.1	83.7	96	154.4	120.7	56	201.7	157 6
17	13.4	10.5	77	60.7	47.4	37	107.9	84.4	97	155.2	121.3	57	202.5	158.2
18	14.2	11.1	78	61.5	48.0	38	108.7	85.0	98	156.0	121.9	58	203.3	158.9
19	15.0	11.7	79	62.1	48.6	39	109.5	85.6	99	156.8	122.5	59	204.1	159.5
20	15.8	12.3	80	63.0	49.3	40	110.3	86.2	200	157.6	123.1	60	204.9	160.1
21	16.5	12.9	81	63.8	49.9	141	111.1	86.8	201	158.4	123.8	261	205.6	160.7
22	17.3	13.5	82	64.6	50.5	42	111.9	87.4	02	159.2	124.4	62	206.4	161.3
23	18.1	14.2	83	65.4	51.1	43	112.7	88.0	03	159.9	125.0	63	207.2	161.9
24	18.9	14.8	84	66 2	51.7	44	113.5	88 7	04	160.7	125.6	64	208.0	162.5
25	19.7	15.4	85	67.0	52.3	45	114.2	89.3	05	161.5	126.2	65	208.8	163.2
26	20.5	16.0	86	67.8	53.0	46	115.0	89.9	06	162.3	126.8	66	209.6	163.8
27	21.3	16.6	87	68.5	53.6	47	115.8	90.5	07	163.1	127.4	67	210.4	164.4
28	22.1	17.2	88	69.3	54.2	48	116.6	91.1	08	163.9	128.1	68	211.2	165.0
29	22.9	17.2	89	70.1	54.8	49	117.4	91.7	09	164.7	128 7	69	211.9	165.6
30	23.6	18.5	90	70.9	55.4	50	118.2	92.4	10	165.4	129.3	70	212.7	166 2
31	24.4	19.1	91	71.7	56.0	151	119.7	93.0	211	166.2	129.9	271	213.5	166.9
32	25.2	19.7	92	72.5	56.6	52	119.8	93.6	12	167.0	130.5	72	214.3	167.5
33	26.0	20.3	93	73.3	57.3	53	120.5	94.2	13	167.8	131.1	73	215.1	168.1
34	26.8	20.9	94	74.1	57.9	54	121.3	94.8	14	168.6	131.8	74	215.9	168.7
35	27.6	21.5	95	74.9	58.5	55	122.1	95.4	15	169.4	132.4	75	216.7	169.3
36	28.4	22.2	96	75.6	59.1	56	122.9	96.0	16	170.2	133.0	76	217.5	169.9
37	29.2	22.8	97	76.4	59.7	57	123.7	96.7	17	171.0	133.6	77	218.2	170.5
38	29.9	23.4	98	77.2	60.3	58	124.5	97 3	18	171.8	134.2	78	219.0	171.2
39	30 7	24.0	99	78.0	61.0	59	125.3	97.9	19	172.5	134.8	79	219.8	171.8
40	31.5	24.6	100	78.8	61.6	60	126.1	98.5	20	173.3	135.5	80	220.6	172 4
41	32.3	25.2	101	79.6	62.2	161	126.9	99.1	221	174.1	136.1	281	221.4	173.0
42	33.1	25.9	02	80.4	62.8	62	127.6	99.7	22	174.9	136.7	82	222.2	173.6
43	33.9	26.5	03	81.2	63.4	63	128.4	100.4	23	175.7	137.3	83	223.0	174.2
44	34 7	27.1	04	81.9	64.0	64	129.2	101.0	24	176.5	137.9	84	223.8	174.9
45	35 5	27.7	05	82 7	64.6	65	130.0	101.6	25	177.3	138.5	85	224.5	175.5
46	36.2	28.3	06	83.5	65.3	66	130.8	102.2	26	178.1	139.1	86	225.3	176.1
47	37.0	28.	07	84.3	65.9	67	131.6	102.8	27	178.9	139.8	87	226.1	176.7
48	37.8	29.6	08	85.1	66.5	68	132.4	103.4	28	179.6	140.4	88	226.9	177.3
49	38.6	30.2	0	85.9	67.1	69	133 2	104.1	29	180.4	141.0	89	227.7	177.9
50	39.4	30.8	10	86.7	67.7	70	133.9	104.7	30	181.2	141.6	90	228.5	178.6
51	40.2	31.4	111	87.5	68.3	171	134.7	105.3	231	182.0	142.2	291	229.3	179.2
52	41.0	32 0	12	88.2	69.0	72	135.5	105.9	32	182.8	142.8	92	230.1	179.8
53	41.8	32.6	13	89.0	69.6	73	136.3	106.5	33	183.6	143.5	93	230.9	180.4
54	42.5	33.2	14	89.8	70.2	74	137.1	107.1	34	184.4	144.1	94	231.6	181.0
55	43.3	33.	1	90.6	70.8	75	137.9	107.7	35	185.2	144.7	95	232.4	181.6
56	44.1	34.5	16	91.4	71.4	76	138.7	108.4	36	185.9	145.3	96	233.2	182.2
57	44 9	35.1	1	2.2	72.0	77	139.5	109.0	37	186.7	145.9	97	234.0	182.9
58	5.7	3 .7	18	93.0	72.7	78	140.2	109.6	38	187.5	146.5	98	234.8	183.5
59	46.5	36 3	1	3.8	73.3	79	141.0	110.2	39	188.3	147.2	99	235.6	184.1
60	47.3	36.	120	94.5	73.9	180	141.8	110.8	240	189.1	147.8	300	236.4	184.7
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

TABLE III. Difference of Latitude and Departure for 39 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	47.4	38.4	121	94.0	76.1	181	140.7	113.9	241	187.5	151.7
2	01.6	01.3	62	48.2	39.0	22	94.8	76.8	82	141.4	114.5	42	188.1	152.3
3	02.3	01.9	63	49.0	39.6	23	95.6	77.4	83	142.2	115.2	43	188.8	152.9
4	03.1	02.5	64	49.7	40.3	24	96.4	78.0	84	143.0	115.8	44	189.6	153.6
5	03.9	03.1	65	50.5	40.9	25	97.1	78.7	85	143.8	116.4	45	190.3	154.2
6	04.7	03.8	66	51.3	41.5	26	97.9	79.3	86	144.5	117.1	46	191.2	154.8
7	05.4	04.4	67	52.1	42.2	27	98.7	79.9	87	145.3	117.7	47	191.9	155.4
8	06.2	05.0	68	52.8	42.8	28	99.5	80.6	88	146.1	118.3	48	192.7	156.1
9	07.0	05.7	69	53.6	43.4	29	100.2	81.2	89	146.9	118.9	49	193.5	156.7
10	07.8	06.3	70	54.4	44.1	30	101.0	81.8	90	147.6	119.6	50	194.3	157.3
11	08.5	06.9	71	55.2	44.7	131	101.8	82.4	191	148.4	120.2	251	195.1	158.0
12	09.3	07.6	72	56.0	45.3	32	102.6	83.1	92	149.2	120.8	52	195.9	158.6
13	10.1	08.2	73	56.7	45.9	33	103.4	83.7	93	150.0	121.5	53	196.6	159.2
14	10.9	08.8	74	57.5	46.6	34	104.1	84.3	94	150.8	122.1	54	197.4	159.8
15	11.7	09.4	75	58.3	47.2	35	104.9	85.0	95	151.5	122.7	55	198.2	160.5
16	12.4	10.1	76	59.1	47.8	36	105.7	85.6	96	152.3	123.3	56	198.9	161.1
17	13.2	10.7	77	59.8	48.5	37	106.5	86.2	97	153.1	124.0	57	199.7	161.7
18	14.0	11.3	78	60.6	49.1	38	107.2	86.8	98	153.9	124.6	58	200.5	162.4
19	14.8	12.0	79	61.4	49.7	39	108.0	87.5	99	154.6	125.2	59	201.3	163.0
20	15.5	12.6	80	62.2	50.3	40	108.8	88.1	200	155.4	125.9	60	202.0	163.6
21	16.3	13.2	81	62.9	51.0	141	109 6	88.7	201	156.2	126.5	261	202.8	164.2
22	17.1	13.8	82	63.7	51.6	42	110.3	89.4	02	157.0	127.1	62	203.6	164.9
23	17.9	14.5	83	64.5	52.2	43	111.1	90.0	03	157.8	127.7	63	204.4	165.5
24	18.7	15.1	84	65.3	52.9	44	111.9	90.6	04	158.5	128.4	64	205.2	166.1
25	19.4	15.7	85	66.1	53.5	45	112.7	91.2	05	159.3	129.0	65	205.9	166.8
26	20.2	16.4	86	66.8	54.1	46	113.5	91.9	06	160.1	129.6	66	206.7	167.4
27	21.0	17.0	87	67.6	54.7	47	114.2	92.5	07	160.9	130.3	67	207.5	168.0
28	21.8	17.6	88	68.4	55.4	48	115.0	93.1	08	161.6	130.9	68	208.3	168.7
29	22.5	18.2	89	69.2	56.0	49	115.8	93.8	09	162.4	131.5	69	209.0	169.3
30	23.3	18.9	90	69.9	56.6	50	116.6	94.4	10	163.2	132.2	70	209.8	169.9
31	24.1	19.5	91	70.7	57.3	151	117.3	95.0	211	164.0	132.8	271	210.6	170.5
32	24.9	20.1	92	71.5	57.9	52	118.1	95.7	12	164.7	133.4	72	211.4	171.2
33	25.6	20.8	93	72.3	58.5	53	118.9	96.3	13	165 5	134.0	73	212.1	171.8
34	26.4	21.4	94	73.0	59.2	54	119.7	96.9	14	166.3	134 7	74	212.9	172.4
35	27.2	22.0	95	73.8	59.8	55	120.5	97 5	15	167.1	135.3	75	213.7	173.1
36	28.0	22.7	96	74.6	60.4	56	121.2	98.2	16	167.9	135.9	76	214 5	173.7
37	28.8	23.3	97	75.4	61.0	57	122.0	98.8	17	168.6	136.6	77	215.3	174.3
38	29.5	23.9	98	76.2	61.7	58	122.8	99.4	18	169.4	137.2	78	216.0	174.9
39	30.3	24.5	99	76.9	62.3	59	123.6	100.1	19	170.2	137.8	79	216.8	175.6
40	31.1	25.2	100	77.7	62.9	60	124.3	100.7	20	171 0	138.4	80	217.6	176.2
41	31.9	25.8	101	78.5	63.5	161	125.1	101.3	221	171.7	139.1	281	218.4	176.8
42	32.6	26.4	02	79.3	64.2	62	125.9	101.9	22	172.5	139.7	82	219.1	177.5
43	33.4	27.1	03	80.0	64.8	63	126.7	102.6	23	173.3	140.3	83	219.9	178.1
44	34.2	27.7	04	80.8	65.4	64	127.4	103.2	24	174.1	141.0	84	220.7	178.7
45	35.0	28.3	05	81.6	66 1	65	128.2	103.8	25	174.8	141.6	85	221.5	179.4
46	35.7	28.9	06	82.4	66.7	66	129.0	104.5	26	175.6	142.2	86	222.3	180.0
47	36.5	29.6	07	83.1	67.3	67	129.8	105.1	27	176.4	142.9	87	223.0	180.6
48	37.3	30.2	08	83.9	68.0	68	130.6	105.7	28	177.2	143.5	88	223.8	181.2
49	38.1	30.8	09	84.7	68.6	69	131.3	106.4	29	178 0	144.1	89	224.6	181.9
50	38.9	31.5	10	85.5	69.2	70	132.1	107.0	30	178.7	144.7	90	225.4	182.5
51	39.6	32.1	111	86.3	69.9	171	132.9	107.6	231	179.5	145.4	291	226.1	183.1
52	40.4	32.7	12	87.0	70.5	72	133.7	108.2	32	180.3	146.0	92	226.9	183.8
53	41.2	33.4	13	87.8	71.1	73	134.4	108.9	33	181.1	146.6	93	227.7	184.4
54	42.0	34.0	14	88.6	71.7	74	135.2	109.5	34	181.8	147.3	94	228.5	185.0
55	42.7	34.6	15	89.4	72.4	75	136.0	110.1	35	182.6	147.9	95	229.2	185.6
56	43.5	35.2	16	90.1	73.0	76	136.8	110.8	36	183.4	148.5	96	230.0	186.3
57	44.3	35.9	17	90.9	73.6	77	137.5	111.4	37	184.2	149.1	97	230.8	186.9
58	45.1	36.5	18	91.7	74.3	78	138.3	112.0	38	185.0	149.8	98	231.6	187.5
59	45.8	37.1	19	92.5	74.9	79	139.1	112.6	39	185.7	150.4	99	232.4	188.2
60	46.6	37.8	120	93.3	75.5	180	139.9	113.3	240	186.5	151.0	300	233.1	188.8
Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 51 Degrees.

Table III. Difference of Latitude and Departure for 40 Degrees

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	46.7	39.2	121	92.7	77.8	181	138.6	116.4	241	184.6	154.9
2	01.5	01.3	62	47.5	39 9	22	93.4	78.4	82	139.4	117.0	42	185.4	155.6
3	02.3	01.9	63	48.3	40.5	23	94.2	79.1	83	140.2	117.7	43	186.1	156.2
4	03.1	02.6	64	49.0	41.1	24	95.0	79.7	84	140.9	118.3	44	186.9	156.9
5	03.8	03.2	65	49.8	41.8	25	95.7	80.4	85	141.7	118.9	45	187.7	157.5
6	04.6	03.9	66	50.6	42.4	26	96.5	81.0	86	142.5	119.6	46	188.4	158.1
7	05.4	04.5	67	51.3	43.1	27	97.3	81.6	87	143.2	120.2	47	189.2	158 8
8	06.1	05.1	68	52.1	43.7	28	98.0	82 3	88	144.0	120.9	48	190.0	159.4
9	06.9	05.8	69	52.9	44.4	29	98.8	82.9	89	144.8	121.5	49	190.7	160.1
10	07.7	06.4	70	53.6	45.0	30	99.6	83.6	90	145.5	122.1	50	191.5	160.7
11	08.4	07.1	71	54.4	45.6	131	100.3	84.2	191	146.3	122.8	251	192.3	161.4
12	09.2	07.7	72	55.2	46.3	32	101.1	84.9	92	147.1	123.4	52	193.0	162.0
13	10.0	08.4	73	55.9	46.9	33	101.9	85.5	93	147.8	124.1	53	183.8	162.6
14	10.7	09.0	74	56.7	47 6	34	102.6	86.1	94	148.6	124.7	54	194.6	163.3
15	11.5	09.6	75	57.4	48.2	35	103.4	86.8	95	149.4	125.4	55	195.3	163.9
16	12.3	10.3	76	58.2	48 9	36	104.2	87.4	96	150.1	126.0	56	196.1	164.6
17	13.0	10.9	77	59.0	49.5	37	104.9	88.1	97	150.9	126.6	57	196.9	165.2
18	13.8	11.6	78	59.7	50.1	38	105.7	88.7	98	151.7	127.3	58	197.6	165.9
19	14.6	12.2	79	60.5	50.8	39	106.5	89.4	99	152.4	127.9	59	198.4	166.5
20	15.3	12.9	80	61.3	51.4	40	107.2	90.0	200	153.2	128.6	60	199.2	167.1
21	16.1	13.5	81	62.0	52.1	141	108.0	90.6	201	154.0	129.2	261	199.9	167.8
22	16.9	14.1	82	62.8	52.7	42	108.8	91.3	02	154.7	129.9	62	200.7	168.4
23	17.6	14.8	83	63.6	53.4	43	109.5	91.9	03	155.5	130.5	63	201.4	169.1
24	18.4	15.4	84	64.3	54.0	44	110.3	92.6	04	156.3	131 1	64	202.2	169.7
25	19.2	16.1	85	65.1	54.6	45	111.1	93.2	05	157.0	131.8	65	203.0	170.4
26	19.9	16.7	86	65.9	55.3	46	111.8	93.9	06	157.8	132.4	66	203.7	171.0
27	20.7	17.4	87	66.6	55.9	47	112.6	94.5	07	158.6	133.1	67	204.5	171.6
28	21.4	18.9	88	67.4	56.6	48	113.4	95.1	08	159.3	133.7	68	205.3	172.3
29	22.2	18.6	89	68.2	57.2	49	114.1	95.8	09	160.1	134.4	69	206.0	172.9
30	23.0	19.3	90	68.9	57.9	50	114.9	96.4	10	160.9	135.0	70	206.8	173.6
31	23.7	19.9	91	69.7	58.5	151	115.7	97.1	211	161.6	135.6	271	207.6	174.2
32	24.5	20.6	92	70.5	59.1	52	116.4	97.7	12	162.4	136.3	72	208.3	174.8
33	25.3	21.2	93	71.2	59.8	53	117.2	98.4	13	163.2	136.9	73	209.1	175.5
34	26.0	21.9	94	72.0	60.4	54	118.0	99.0	14	163.9	137.6	74	209.9	176.1
35	26.8	22.5	95	72.8	61.1	55	118.7	99.6	15	164.7	138.2	75	210.6	176.8
36	27.6	23.1	96	73.5	61.7	56	119.5	100.3	16	165.4	138.8	76	211.4	177.4
37	28.3	23.8	97	74.3	62.4	57	120.3	100.9	17	166.2	139.5	77	212.2	178.1
38	29.1	24.4	98	75.1	63.0	58	121.0	101.6	18	167.0	130.1	78	212.9	178.7
39	29.9	25.1	99	75.8	63.6	59	121.8	102.2	19	167.7	140.8	79	213.7	179.3
40	30.6	25.7	100	76.6	64.3	60	122.6	102.8	20	168.5	141.4	80	214.5	180.0
41	31.4	26.4	101	77.4	64.9	161	123.3	103.5	221	169.3	142.1	281	215.2	180.6
42	32.2	27.0	02	78.1	65.6	62	124.1	104.1	22	170.0	142.7	82	216.0	181.3
43	32.9	27.6	03	78.9	66.2	63	124.9	104.8	23	170.8	143.3	83	216.8	181.9
44	33.7	28.3	04	79.7	66.8	64	125.6	105.4	24	171.6	144.0	84	217.5	182.6
45	34.5	28.9	05	80.4	67.5	65	126.4	106.1	25	172.3	144.6	85	218.3	183.2
46	35.2	29.6	06	81.2	68.1	66	127.2	106.7	26	173.1	145.3	86	219.1	183.9
47	36.0	30.2	07	82.0	68.8	67	127.9	107.3	27	173.9	145.9	87	219.8	184.5
48	36.8	30.8	08	82.7	69.4	68	128.7	108.0	28	174.6	146.6	88	220.6	185.1
49	37.5	31.5	09	83.5	70.1	69	129.4	108.6	29	175.4	147.2	89	221.4	185.8
50	38.3	32.1	10	84.3	70.7	70	130.2	109.3	30	176.2	147.9	90	222.1	186.4
51	39.1	32.8	111	85.0	71.3	171	131.0	109.9	231	176.9	148.3	291	222.9	187.1
52	39.8	33.4	12	85.8	72.0	72	131.7	110.6	32	177.7	149.1	92	223.7	187.7
53	40.6	34.1	13	86.6	72.6	73	132.5	111.2	33	178.5	149.8	93	224.4	188.4
54	41.4	34.7	14	87.3	73.3	74	133.3	111.9	34	179.2	150.4	94	225.2	189.0
55	42.1	35 3	15	88.1	73.9	75	134.0	112.5	35	180.0	151.1	95	226.0	189.6
56	42.9	36.0	16	88.9	74.6	76	134.8	113.1	36	180.8	151.7	96	226.7	190.3
57	43.7	36.6	17	89.6	75.2	77	135.6	113.8	37	181.5	152.4	97	227.5	190.9
58	44.4	37.3	18	90.4	75.9	78	136.3	114.4	38	182.3	153.0	98	228.3	191.6
59	45.2	37.9	19	91.2	76.5	79	137.1	115.1	39	183.1	153.6	99	229.0	192.2
60	46.0	38.6	120	91.9	77.1	80	137.9	115.7	240	183.8	154.3	300	229.8	192.9
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 50 Degrees.

TABLE III. Difference of Latitude and Departure for 41 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	D	Lat.	Dep.
1	00.8	00.7	61	46.0	40.0	121	91.3	79.4	181	136.6	118.7	241	181.9	158.1
2	01.5	01.3	62	46.8	40.7	22	92.1	80 0	82	137.4	119.4	42	182.6	158.7
3	02.3	02.0	63	47.5	41.3	23	92.8	80.7	83	138.1	120.0	43	183.4	159.4
4	03.0	02.6	64	48.3	42.0	24	93.6	81.3	84	138.9	120.7	44	184.2	160.0
5	03.8	03.3	65	49.1	42.6	25	94.3	82.0	85	139.6	121.4	45	184.9	160.7
6	04.5	03.9	66	49.8	43.3	26	95.1	82.6	86	140.4	122.0	46	185.7	161.4
7	05.3	04.6	67	50.6	44.0	27	95.8	83.3	87	141.1	122.7	47	186.4	162.0
8	06.0	05.2	68	51.3	44.6	28	96.6	83.0	88	141.9	123.3	48	187.2	162.7
9	06.8	05.9	69	52.1	45.3	29	97.4	84.6	89	142.6	124.0	49	187.9	163.3
10	07.5	06.6	70	52.8	45.9	30	98.1	85.3	90	143.4	124.6	50	188.7	164.0
11	08.3	07.2	71	53.6	46.6	131	98.9	85.9	191	144.2	125.3	251	189.4	164.6
12	09.1	07.9	72	54.3	47.2	32	99.6	86.6	92	144.9	125.9	52	190.2	165.3
13	09.8	08.5	73	55.1	47.9	33	100.4	87.2	93	145.7	126.6	53	190.9	166.0
14	10.6	09.2	74	55.8	48.5	34	101.1	87.9	94	146.4	127.3	54	191.7	166.6
15	11.3	09.8	75	56.6	49.2	35	101.9	88.6	95	147.2	127.9	55	192.5	167.3
16	12.1	10.5	76	57.4	49.9	36	102.6	89.2	96	147.9	128.6	56	193.2	167.9
17	12.8	11.2	77	58.1	50.5	37	103.4	89.9	97	148.7	129.2	57	194.0	168.6
18	13.6	11.8	78	58.9	51.2	38	104.2	90.5	98	149.4	129.9	58	194.7	169.2
19	14.3	12.5	79	59.6	51.8	39	104.9	91.2	99	150.2	130.5	59	195.5	169.9
20	15.1	13.1	80	60.4	52.5	40	105.7	91.8	200	150.9	131.2	60	196.2	170.5
21	15.8	13.8	81	61.1	53.1	141	106.4	92.5	201	151.7	131.8	261	197.0	171.2
22	16.6	14.4	82	61.9	53.8	42	107.2	93.1	02	152.5	132.5	62	197.7	171.9
23	17.4	15.1	83	62.6	54.4	43	107.9	93.8	03	153.2	133 2	63	198.5	172.5
24	18.1	15.7	84	63.4	55.1	44	108.7	94.5	04	154.0	133.8	64	199.2	173.2
25	18.9	16.4	85	64.2	55.8	45	109.4	95.1	05	154.7	134.5	65	200.0	173.8
26	19.6	17.1	86	64.9	56.4	46	110.2	95.8	06	155.5	135.1	66	200.8	174.5
27	20.4	17.7	87	65.7	57.1	47	110.9	96.4	07	156.2	135.8	67	201.5	175.1
28	21.1	18.4	88	66.4	57.7	48	111.7	97.1	08	157.0	136.4	68	202.3	175.8
29	21.9	19.0	89	67.2	58.4	49	112.5	97.7	09	157.7	137.1	69	203.0	176.4
30	22.6	19.7	90	67.9	59.0	50	113.2	98.4	10	158.5	137.7	70	203.8	177.1
31	23.4	20.3	91	68.7	59.7	151	114.0	99.0	211	159.2	138.4	271	204.5	177.8
32	24.2	21.0	92	69.4	60.4	52	114.7	99.7	12	160.0	139.1	72	205.3	178.4
33	24.9	21.6	93	70.2	61.0	53	115.5	100.4	13	160.8	139.7	73	206.0	179.1
34	25.7	22.3	94	70.9	61.7	54	116.2	101.0	14	161.5	140.4	74	206.8	179.7
35	26.4	23.0	95	71.7	62.3	55	117.0	101.7	15	162.3	141.0	75	207.5	180.4
36	27.2	23.6	96	72.5	63.0	56	117.7	102.3	16	163.0	141.7	76	208.3	181.0
37	27.9	24.3	97	73.2	63.6	57	118.5	103.0	17	163.7	142.3	77	209.1	181.7
38	28.7	24.9	98	74.0	64.3	58	119.2	103.6	18	164.5	143.0	78	209.8	182.4
39	29.4	25.6	99	74.7	64.9	59	120.0	104.3	19	165.3	143.6	79	210.6	183.0
40	30.2	26.2	100	75.5	65.6	60	120.8	105.0	20	166.0	144.3	80	211.3	183.7
41	30.9	26.9	101	76.2	66.3	161	121.5	105.6	221	166.8	145.0	281	212.1	184.3
42	31.7	27.6	02	77.0	66.9	62	122.3	106.3	22	167.5	145.6	82	212.8	185.0
43	32.5	28 2	03	77.7	67.6	63	123.0	106.9	23	168.3	146.3	83	213.6	185.6
44	33.2	28.9	04	78.5	68.2	64	123.8	107.6	24	169.1	146.9	84	214 3	186.3
45	34.0	29.5	05	79.2	68.9	65	124.5	108.2	25	169.8	147.6	85	215.1	186.9
46	34.7	30.2	06	80.0	69.5	66	125.3	108.9	26	170.6	148.2	86	215 8	187.6
47	35.5	30.8	07	80.8	70.2	67	126.0	109.5	27	171.3	148.9	87	216.6	188.3
48	36.2	31.5	08	81.5	70.8	68	126.8	110.2	28	172.1	149.6	88	217.4	188.9
49	37.0	32.1	09	82.3	71.5	69	127.5	110.9	29	172.8	150.2	89	218.1	189.6
50	37.7	32.8	10	83.0	72.2	70	128.3	111.5	30	173.6	150.9	90	218.9	190.3
51	38.5	33.5	111	83.8	72.8	171	129.1	112.2	231	174.3	151.5	291	219.6	190.9
52	39.2	34.1	12	84.5	73.5	72	129.8	112.8	32	175.1	152.2	92	220.4	191.5
53	40.0	34.8	13	85.3	74.1	73	130.6	113.5	33	175.8	152.8	93	221.1	192.2
54	40.8	35.4	14	86.0	74.8	74	131.3	114.1	34	176.6	153.5	94	221.9	192.8
55	41.5	36.1	15	86.8	75.4	75	132.1	114.8	35	177.4	154.1	95	222.6	193.5
56	42.3	36.7	16	87.5	76.1	76	132.8	115.4	36	178.1	154.8	96	223.4	194.2
57	43.0	37.4	17	88.3	76.7	77	133.6	116.1	37	178.9	155.5	97	224.2	194.8
58	43.8	38.0	18	89.1	77.4	78	134.3	116.8	38	179.6	156.1	98	224.9	195.5
59	44.5	38.7	19	89.8	78.1	79	135.1	117.4	39	180.4	156.8	99	225.7	196.1
60	45.3	39.4	120	90.6	78.7	180	135.8	118.1	240	181.1	157.4	300	226.4	196.8
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	45.3	40.8	121	89.9	80.9	181	134.5	121.1	241	179.0	161.2
2	01.5	01.3	62	46.1	41.5	22	90.6	81.6	82	135.2	121.8	42	179.8	161.9
3	02.2	02.0	63	46.8	42.1	23	91.4	82.3	83	135.9	122.4	43	180.5	162.6
4	03.0	02.7	64	47.5	42.8	24	92.1	83.0	84	136.7	123.1	44	181.3	163.2
5	03.7	03.3	65	48.3	43.5	25	92.9	83.6	85	137.4	123.8	45	182.0	163.9
6	04.5	04.0	66	49.0	44.2	26	93.6	84.3	86	138.2	124.4	46	182.7	164.6
7	05.2	04.7	67	49.8	44.8	27	94.3	85.0	87	138.9	125.1	47	183.5	165.2
8	05.9	05.4	68	50.5	45.5	28	95.1	85.6	88	139.7	125.8	48	184.2	165.9
9	06.7	06.0	69	51.3	46.2	29	95.8	86.3	89	140.4	126.4	49	185.0	166.6
10	07.4	06.7	70	52.0	46.8	30	96.6	87.0	90	141.1	127.1	50	185.7	167.2
11	08.2	07.4	71	52.7	47.5	131	97.3	87.6	191	141.9	127.8	251	186.5	167.9
12	08.9	08.0	72	53.5	48.2	32	98.1	88.3	92	142.6	128.4	52	187.2	168.6
13	09.7	08.7	73	54.2	48.8	33	98.8	89.0	93	143.4	129.1	53	187.9	169.3
14	10.4	09.4	74	55.0	49.5	34	99.5	89.6	94	144.1	129.8	54	188.7	169.9
15	11.1	10.0	75	55.7	50.2	35	100.3	90.3	95	144.9	130.5	55	189.4	170.6
16	11.9	10.7	76	56.5	50.8	36	101.0	91.0	96	145.6	131.1	56	190.2	171.3
17	12.6	11.4	77	57.2	51.5	37	101.8	91.7	97	146.3	131.8	57	190.9	171.9
18	13.4	12.0	78	57.9	52.2	38	102.5	92.3	98	147.1	132.5	58	191.7	172.6
19	14.1	12.7	79	58.7	52.9	39	103.3	93.0	99	147.8	133.1	59	192 4	173.3
20	14.9	13.4	80	59 4	53.5	40	104.0	93.7	200	148.6	133.6	60	193.1	173.9
21	15.6	14.0	81	60.2	54.2	141	104.7	94.3	201	149.3	134.5	261	193.9	174.6
22	16.3	14.7	82	60.9	54.9	42	105.5	95.0	02	150.1	135.1	62	194.6	175.3
23	17.1	15.4	83	61.7	55.5	43	106.2	95.7	03	150.8	135.8	63	195.4	175.9
24	17.8	16.1	84	62.4	56.2	44	107.0	96.3	04	151.5	136.5	64	196.1	176.6
25	18.6	16.7	85	63.1	56.9	45	107.7	97.0	05	152.3	137.1	65	196.9	177.3
26	19.3	17.4	86	63.9	57.5	46	108.5	97.7	06	153.0	137.8	66	197.6	177.9
27	20.1	18.1	87	64.6	58.2	47	109.2	98.3	07	153.8	138.5	67	198.3	178.6
28	20.8	18.7	88	65.4	58.9	48	109.9	99.0	08	154.5	139.1	68	199.1	179.3
29	21.5	19.4	89	66.1	59.5	49	110.7	99.7	09	155.3	139.8	69	199.8	180.0
30	22.3	20.1	90	66.9	60.2	50	111.4	100.4	10	156.0	140.5	70	200.6	180.6
31	23.0	20.7	91	67.6	60.9	151	112.2	101.0	211	156.7	141.2	271	201.3	181.3
32	23.8	21.4	92	68.3	61.5	52	112.9	101.7	12	157.5	141.8	72	202.1	182.0
33	24.5	22.1	93	69.1	62.2	53	113.7	102.4	13	158.2	142.5	73	202.8	182.6
34	25.3	22.7	94	69.8	62.9	54	114.4	103.0	14	159.0	143.2	74	203.5	183.3
35	26.0	23.4	95	70.6	63.6	55	115.1	103.7	15	159.7	143.8	75	204.3	184.0
36	26.7	24.1	96	71.3	64.3	56	115.9	104.4	16	160.5	144.5	76	205.0	184.6
37	27.5	24.8	97	72.1	64.9	57	116.6	105.0	17	161.2	145.2	77	205.8	185.3
38	28.2	25.4	98	72.8	65.6	58	117.4	105.7	18	161.9	145.8	78	206.5	186.0
39	29.0	26.1	99	73.5	66.2	59	118.1	106.4	19	162.7	146.5	79	207.3	186.6
40	29.7	26 8	100	74.3	66.9	60	118.9	107.0	20	163.4	147.2	80	208.0	187.3
41	30.5	27.4	101	75.0	67.6	161	119.6	107.7	221	164.2	147.8	281	208.7	188.0
42	31.2	28.1	02	75.8	68.2	62	120.3	108.4	22	164.9	148.5	82	209.5	188.7
43	31.9	28.8	03	76.5	68.9	63	121.1	109.0	23	165.7	149.2	83	210.2	189.3
44	32.7	29.4	04	77.3	69.6	64	121.8	109.7	24	166.4	149.9	84	211.0	190.0
45	33.4	30.1	05	78.0	70.2	65	122.6	110.4	25	167.1	150.5	85	211.7	190.7
46	34.2	30.8	06	78.7	70.9	66	123.3	111.0	26	167.9	151.2	86	212.5	191.3
47	34.9	31.4	07	79.5	71.6	67	124.1	111.7	27	168.6	151.9	87	213.2	192.0
48	35.7	32.1	08	80.2	72.3	68	124.8	112.4	28	169.4	152.5	88	213.9	192.7
49	36.4	32.8	09	81.0	72.9	69	125.5	113.1	29	170.1	153.2	89	214.7	193.3
50	37.1	33.5	10	81.7	73.6	70	126.3	113.7	30	170.9	153.9	90	215.4	194.2
51	37.9	34.1	111	82.5	74.3	171	127.0	114.4	231	171.6	154.5	291	216.2	194.7
52	38.6	34.8	12	83.2	74.9	72	127.8	115.1	32	172.3	155.2	92	216.9	195.3
53	39.4	35.5	13	83.9	75.6	73	128.5	115.7	33	173.1	155.9	93	217.7	196.0
54	40.1	36.1	14	84.7	76.3	74	129.3	116.4	34	173.8	156.5	94	218.4	196.7
55	40.9	36.8	15	85.4	76.9	75	130.0	117.1	35	174.6	157.2	95	219.1	197.4
56	41.6	37.5	16	86.2	77.6	76	130.7	117.7	36	175.3	157.9	96	219.9	198.0
57	42.3	38.1	17	86.9	78.3	77	131.5	118.4	37	176.1	158.5	97	220.6	198.7
58	43.1	38.8	18	87.7	78.9	78	132.2	119.1	38	176.8	159.2	98	221.4	199.4
59	43.8	39.5	19	88.4	79.6	79	133.0	119.7	39	177.5	159.9	99	222.1	200.1
60	44.6	40.1	120	89.2	80.2	180	133.7	120.4	240	178.3	160.6	300	222.9	200.8
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 48 Degrees.

Table III. Difference of Latitude and Departure for 43 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	44.6	41.6	121	88.5	82.5	181	132.4	123.4	241	176.3	164.3
2	01.5	01.4	62	45.3	42.3	22	89.2	83.2	82	133.1	124.1	42	177.0	165.0
3	02.2	02.0	63	46.1	43.0	23	90.0	83.9	83	133.8	124.8	43	177.7	165.7
4	02.9	02.7	64	46.8	43.6	24	90.7	84.6	84	134.6	125.5	44	178.4	166.4
5	03.7	03.4	65	47.5	44.3	25	91.4	85.2	85	135.3	126.2	45	179.2	167.1
6	04.4	04.1	66	48.3	45.0	26	92.1	85.9	86	136.0	126.8	46	179.9	167.7
7	05.1	04.8	67	49.0	45.7	27	92.9	86.6	87	136.8	127.5	47	180.6	168.4
8	05.9	05.5	68	49.7	46.4	28	93.6	87.3	88	137.5	128.2	48	181.4	169.1
9	06.6	06.2	69	50.5	47.1	29	94.3	88.0	89	138.2	128.9	49	182.1	169.8
10	07.3	06.8	70	51.2	47.7	30	95.1	88.6	90	139.0	129.5	50	182.8	170.5
11	08.0	07.5	71	51.9	48.4	131	95.8	89.3	191	139.7	130.2	251	183.6	171.2
12	08.8	08.2	72	52.7	49.1	32	96.5	90.0	92	140.4	130.9	52	184.3	171.8
13	09.5	08.9	73	53.4	49.8	33	97.3	90.7	93	141.1	131.6	53	185.0	172.5
14	10.2	09.5	74	54.1	50.5	34	98.0	91.4	94	141.9	132.3	54	185.8	173.2
15	11.0	10.2	75	54.9	51.2	35	98.7	92.1	95	142.6	133.0	55	186.5	173.9
16	11.7	10.9	76	55.6	51.8	36	99.5	92.7	96	143.3	133.6	56	187.2	174.5
17	12.4	11.6	77	56.3	52.5	37	100.2	93.4	97	144.1	134.3	57	187.9	175.2
18	13.2	12.3	78	57.0	53.2	38	100.9	94.1	98	144.8	135.0	58	188.7	175.9
19	13.9	13.0	79	57.8	53.9	39	101.7	94.8	99	145.5	135.7	59	189.4	176.6
20	14.6	13.6	80	58.5	54.5	40	102.4	95.5	200	146.3	136.4	60	190.1	177.3
21	15.4	14.3	81	59.2	55.2	141	103.1	96.2	201	147.0	137.1	261	190.9	178.0
22	16.1	15.0	82	60.0	55.9	42	103.9	96.8	02	147.7	137.7	62	191.6	178.6
23	16.8	15.7	83	60.7	56.6	43	104.6	97.5	03	148.5	138.4	63	192.3	179.3
24	17.6	16.4	84	61.4	57.3	44	105.3	98.2	04	149.2	139.1	64	193.1	180.0
25	18.3	17.1	85	62.2	58.0	45	106.0	98.9	05	149.9	139.8	65	183.8	180.7
26	19.0	17.1	86	62.9	58.6	46	106.8	99.5	06	150.7	140.5	66	194.5	181.4
27	19.7	18.4	87	63.6	59.3	47	107.5	100.2	07	151.4	141.2	67	195.3	182.1
28	20.5	19.1	88	64.4	60.0	48	108.2	100.9	08	152.1	141.8	68	196.0	182.7
29	21.2	19.8	89	65.1	60.7	49	109.0	101.6	09	152.9	142.5	69	196.7	183.4
30	21.9	20.5	90	65.8	61.4	50	109.7	102.3	10	153.6	143.2	70	197.5	184.1
31	22.7	21.2	91	66.5	62.1	151	110.4	103.0	211	154.4	143.9	271	198.2	184.8
32	23.4	21.8	92	67.3	62.7	52	111.2	103.6	12	155.0	144.5	72	198.9	185.5
33	24.1	22.5	93	68.0	63.4	53	111.9	104.3	13	155.8	145.2	73	199.7	186.2
34	24.9	23.2	94	68.7	64.1	54	112.6	105.0	14	156.5	145.9	74	200.4	186.8
35	25.6	23.9	95	69.5	64.8	55	113.4	105.7	15	157.2	146.6	75	201.1	187.5
36	26.3	24.5	96	70.2	65.5	56	114.1	106.4	16	158.0	147.3	76	201.9	188.2
37	27.1	25.2	97	70.9	66.2	57	114.8	107.1	17	158.7	148.0	77	202.6	188.9
38	27.8	25.9	98	71.7	66.8	58	115.6	107.7	18	159.4	148.6	78	203.3	189.5
39	28.5	26.6	99	72.4	67.5	59	116.3	108.4	19	160.2	149.3	79	204.0	190.2
40	29.3	27.3	100	73.1	68.2	60	117.0	109.1	20	160.9	150.0	80	204.8	190.9
41	30.0	28.0	101	73.9	68.9	161	117.7	109.8	221	161.6	150.7	281	205.5	191.6
42	30.7	28.6	02	74.6	69.5	62	118.5	110.5	22	162.4	151.4	82	206.2	192.3
43	31.4	29.3	03	75.3	70.2	63	119.2	111.2	23	163.1	152.1	83	207.0	193.0
44	32.2	30.0	04	76.1	70.9	64	119.9	111.8	24	163.8	152.7	84	207.7	193.6
45	32.9	30.7	05	76.8	71.6	65	120.7	112.5	25	164.6	153.4	85	208.4	194.3
46	33.6	31.4	06	77.5	72.3	66	121.4	113.2	26	165.3	154.1	86	209.2	195.0
47	34.4	32.1	07	78.3	73.0	67	122.1	113.9	27	166.0	154.8	87	209.9	195.7
48	35.1	32.7	08	79.0	73.6	68	122.9	114.5	28	166.7	155.5	88	210.6	196.4
49	35.8	33.4	09	79.7	74.3	69	123.6	115.2	29	167.5	156.2	89	211.4	197.1
50	36.6	34.1	10	80.4	75.0	70	124.3	115.9	30	168.2	156.8	90	212.1	197.7
51	37.3	34.8	111	81.2	75.7	171	125.1	116.6	231	168.9	157.5	291	212.8	198.4
52	38.0	35.5	12	81.9	76.4	72	125.8	117.3	32	169.7	158.2	92	213.6	199.1
53	38.8	36.2	13	82.6	77.1	73	126.5	118.0	33	170.4	158.9	93	214.3	199.8
54	39.5	36.8	14	83.4	77.7	74	127.3	118.6	34	171.1	159.5	94	215.0	200.5
55	40.2	37.5	15	84.1	78.4	75	128.0	119.3	35	171.9	160.2	95	215.7	201.2
56	41.0	38.2	16	84.8	79.1	76	128.7	120.0	36	172.6	160.9	96	216.5	201.8
57	41.7	38.9	17	85.6	79.8	77	129.4	120.7	37	173.3	161.6	97	217.2	202.5
58	42.4	39.5	18	86.3	80.5	78	130.2	121.4	38	174.1	162.3	98	218.0	203.2
59	43.1	40.2	19	87.0	81.2	79	130.9	122.1	39	174.8	163.0	99	218.7	203.9
60	43.9	40.9	120	87.8	81.8	80	131.6	122.7	240	175.5	163.6	300	219.4	204.6
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 47 Degrees.

TABLE III. Difference of Latitude and Departure for 44 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	43.9	42.4	121	87.0	84.0	181	130.2	125.7	241	173.4	167.4
2	01.4	01.4	62	44.6	43.1	22	87.8	84.7	82	130.9	126.4	42	174.1	168.1
3	02.2	02.1	63	45.3	43.8	23	88.5	85.4	83	131.6	127.1	43	174.8	168.8
4	02.9	02.8	64	46.0	44.5	24	89.2	86.1	84	132.4	127.8	44	175.5	169.5
5	03.6	03.5	65	46.8	45.1	25	89.9	86.8	85	133.1	128.5	45	176.2	170.2
6	04.3	04.2	66	47.5	45.8	26	90.6	87.5	86	133.8	129.2	46	176.9	170.9
7	05.0	04.9	67	48.2	46.5	27	91.4	88.2	87	134.5	129.9	47	177.7	171.6
8	05.8	05.6	68	48.9	47.2	28	92.1	88.9	88	135.2	130.6	48	178.4	172.3
9	06.5	06.3	69	49.6	47.9	29	92.8	89.6	89	135.9	131.3	49	179.1	173.0
10	07.2	06.9	70	50.3	48.6	30	93.5	90.3	90	136.7	132.0	50	179.8	173.6
11	07.9	07.6	71	51.1	49.3	131	94.2	91.0	191	137.4	132.7	251	180.5	174.3
12	08.6	08.3	72	51.8	50.0	32	94.9	91.7	92	138.1	133.4	52	181.3	175.0
13	09.4	09.0	73	52.5	50.7	33	95.7	92.4	93	138.8	134.1	53	182.0	175.7
14	10.1	09.7	74	53.2	51.4	34	96.4	93.1	94	139.5	134.8	54	182.7	176.4
15	10.8	10.4	75	53.9	52.1	35	97.1	93.8	95	140.3	135.4	55	183.4	177.1
16	11.5	11.1	76	54.7	52.8	36	97.8	94.5	96	141.0	136.1	56	184.1	177.8
17	12.2	11.8	77	55.4	53.5	37	98.5	95.2	97	141.7	136.8	57	184.9	178.5
18	12.9	12.5	78	56.1	54.2	38	99.3	95.9	98	142.4	137.5	58	185.6	179.2
19	13.7	13.2	79	56.8	54.9	39	100.0	96.5	99	143.1	138.2	59	186.3	179.9
20	14.4	13.9	80	57.5	55.6	40	100.7	97.2	200	143.9	138.9	60	187.0	180.6
21	15.1	14.6	81	58.3	56.3	141	101.4	97.9	201	144.6	139.6	261	187.7	181.3
22	15.8	15.3	82	59.0	57.0	42	102.1	98.6	02	145.3	140.3	62	188.4	182.0
23	16.5	16.0	83	59.7	57.7	43	102.9	99.3	03	146.0	141.0	63	189.2	182.7
24	17.3	16.7	84	60.4	58.3	44	103.6	100.0	04	146.7	141.7	64	189.9	183.4
25	18.0	17.4	85	61.1	59.0	45	104.3	100.7	05	147.5	142.4	65	190.6	184.1
26	18.7	18.1	86	61.9	59.7	46	105.0	101.4	06	148.2	143.1	66	191.3	184.8
27	19.4	18.8	87	62.6	60.4	47	105.7	102.1	07	148.9	143.8	67	192.1	185.5
28	20.1	19.4	88	63.3	61.1	48	106.5	102.8	08	149.6	144.5	68	192.8	186.1
29	20.9	20.1	89	64.1	61.8	49	107.2	103.5	09	150.3	145.2	69	193.5	186.8
30	21.6	20.8	90	64.7	62.5	50	107.9	104.2	10	151.1	145.9	70	194.2	187.5
31	22.3	21.5	91	65.5	63.2	151	108.6	104.9	211	151.8	146.6	271	194.9	188.2
32	23.0	22.2	92	66.2	63.9	52	109 3	105.6	12	152.5	147.3	72	195.6	188.9
33	23.7	22.9	93	66.9	64.6	53	110.1	106.3	13	153.2	147.9	73	196.4	189.6
34	24.5	23.6	94	67.6	65.3	54	110.8	107.0	14	153.9	148.6	74	197.1	190.3
35	25.2	24.3	95	68.3	66.0	55	111.5	107.7	15	154.6	149.3	75	197.8	191.0
36	25.9	25.0	96	69.1	66.7	56	112.2	108.4	16	155.4	150.0	76	198.5	191.7
37	26.6	25.7	97	69.8	67.4	57	112.9	109.1	17	156.1	150.7	77	199.2	192.4
38	27.3	26.4	98	70.5	68.1	58	113.7	109.7	18	156.8	151.4	78	200.0	193.1
39	28.1	27.1	99	71.2	68.8	59	114.4	110.4	19	157.5	152.1	79	200.7	193.8
40	28.8	27.8	100	71.9	69.5	60	115.1	111.1	20	158.2	152.8	80	201.4	194.5
41	29.5	28.5	101	72.6	70.2	161	115.8	111.8	221	159.0	153.5	281	202.1	195.2
42	30.2	29.2	02	73.4	70.8	62	116.5	112.5	22	159.7	154.2	82	202.8	195.9
43	30.9	29.9	03	74.1	71.5	63	117.2	113.2	23	160.4	154.9	83	203.6	196.6
44	31.6	30.6	04	74.8	72.2	64	118.0	113.9	24	161.1	155.6	84	204.3	197.3
45	32.4	31.3	05	75.5	72.9	65	118.7	114.6	25	161.8	156.3	85	205.0	198.0
46	33.1	32.0	06	76.2	73.6	66	119.4	115.3	26	162.6	157.0	86	205.7	198.7
47	33.8	32.6	07	77.0	74.3	67	120.1	116.0	27	163.3	157.7	87	206.4	199.3
48	34.5	33.3	08	77.7	75.0	68	120.8	116.7	28	164.0	158.4	88	207.2	200.0
49	35.2	34.0	09	78.4	75.7	69	121.6	117.4	29	164.7	159.1	89	207.9	200.7
50	36.0	34.7	10	79.1	76.4	70	122.3	118.1	30	165 4	159.8	90	208.6	201.4
51	36.7	35.4	111	79.8	77.1	171	123.0	118.8	231	166.2	160.4	291	209.3	202.1
52	37.4	36.1	12	80.6	77.8	72	123.7	119.5	32	166.9	161.1	92	210.0	202.8
53	38.1	36.8	13	81.3	78.5	73	124.4	120.2	33	167.6	161.8	93	210.8	203.5
54	38.8	37.5	14	82.0	79.2	74	125.2	120.9	34	168.3	162.5	94	211.5	204.2
55	39.6	38.2	15	82.7	79.9	75	125.9	121.6	35	169.0	163.2	95	212.2	204.9
56	40.3	38.9	16	83.4	80.6	76	126.6	122.2	36	169.8	163.9	96	212.9	205.6
57	41.0	39.6	17	84.2	81.3	77	127.3	122.9	37	170.5	164.6	97	213.6	206.3
58	41.7	40.3	18	84.9	82.0	78	128.0	123.6	38	171 2	165.3	98	214.4	207.0
59	42.4	41.0	19	85.6	82.7	79	128.8	124.3	39	171.9	166.0	99	215.1	207.7
60	43.2	41.7	120	86.3	83.4	180	129.5	125.0	240	172.6	166.7	300	215.8	208.4
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 46 Degrees.

TABLE III. Difference of Latitude and Departure for 45 Degrees.

Dist	Lat.	Dep	Dist	Lat.	Dep	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	01.4	01.4	62	43.8	43.8	22	86.3	86.3	82	128.7	128 7	42	171.1	171.1
3	02.1	02.1	63	44.5	44.5	23	87.0	87.0	83	129.4	129.4	43	171.8	171.8
4	02.8	02.8	64	45.3	45.3	24	87.7	87.7	84	130.1	130.1	44	172.5	172.5
5	03.5	03.5	65	46.0	46.0	25	88.4	88.4	85	130.8	130.8	45	173.2	173.2
6	04.2	04.2	66	46.7	46.7	26	89.1	89.1	86	131.5	131.5	46	173.9	173.9
7	04.9	04.9	67	47.4	47.4	27	89.8	89.8	87	132.2	132.2	47	174.6	174.6
8	05.7	05.7	68	48.1	48.1	28	90.5	90.5	88	132.9	132.9	48	175.4	175.4
9	06.4	06.4	69	48.8	48.8	29	91.2	91.2	89	133.6	133.6	49	176.1	176.1
10	07.1	07.1	70	49.5	49.5	30	91.9	91.9	90	134.3	134.3	50	176.8	176.8
11	07.8	07.8	71	50.2	50.2	131	92.7	92.7	191	135.1	135.1	251	177.5	177.5
12	08.5	08.5	72	50.9	50.9	32	93.3	93.3	92	135.8	135.8	52	178.2	178.2
13	09.2	09.2	73	51.6	51.6	33	94.0	94.0	93	136.5	136.5	53	178.9	178.9
14	09.9	09.9	74	52.3	52.3	34	94.7	94.7	94	137.2	137.2	54	179.6	179.6
15	10.6	10.6	75	53.0	53.0	35	95.5	95.5	95	137.9	137.9	55	180.8	180.3
16	11.3	11.3	76	53.7	53.7	36	96.2	96.2	96	138.6	138.6	56	181.0	181.0
17	12.0	12.0	77	54.4	54.4	37	96.9	96.9	97	139.3	139.3	57	181.7	181.7
18	12.7	12.7	78	55.2	55.2	38	97.6	97 6	98	140.0	140.0	58	182.4	182.4
19	13.4	13.4	79	55.9	55.9	39	98.3	98.3	99	140.7	140.7	59	183.1	183.1
20	14.1	14.1	80	56.6	56.6	40	99.0	99.0	200	141.4	141.4	60	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.5	184.5
22	15.6	15.6	82	58.0	58.0	42	100.4	100.4	02	142.8	142.8	62	185.3	185.3
23	16.3	16.3	83	58.7	58.7	43	101.1	101.1	03	143.5	143.5	63	186.0	186.0
24	17.0	17.0	84	59.4	59.4	44	101.8	101.8	04	144.2	144.2	64	186.7	186.7
25	17.7	17.7	85	60.1	60.1	45	102.5	102.5	05	144.9	144.9	65	187.4	187.4
26	18.4	18.4	86	60.8	60.8	46	103.2	103.2	06	145.7	145.7	66	188.1	188.1
27	19.1	19.1	87	61.5	61.5	47	103.9	103.9	07	146.4	146.4	67	188.8	188.8
28	19.8	19.8	88	62.2	62.2	48	104.6	104.6	08	147.1	147.1	68	189.5	189.5
29	20.5	20.5	89	62.9	62.9	49	105.4	105.4	09	147.8	147.8	69	190.2	190.2
30	21.2	21.2	90	63.6	63.6	50	106.1	106.1	10	148.5	148.5	70	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	22.6	22.6	92	65.1	65.1	52	107.5	107.5	12	149.9	149.9	72	192.3	192.3
33	23.3	23.3	93	65.8	65.8	53	108.2	108.2	13	150.6	150.6	73	193.0	193.0
34	24.0	24.0	94	66.5	66.5	54	108.9	109.9	14	151.3	151.3	74	193.7	193.7
35	24.7	24.7	95	67.2	67.2	55	109.6	109.6	15	152.0	152.0	75	194.4	194.4
36	25.5	25.5	96	67.9	67.9	56	110.3	110.3	16	152.7	152.7	76	195.2	195.2
37	26.2	26.2	97	68.6	68.6	57	111.0	111.0	17	153.4	153.4	77	195.9	195.9
38	26.9	26.9	98	69.3	69.3	58	111.7	111.7	18	154.1	154.1	78	196.6	196.6
39	27.6	27.6	99	70.0	70.0	59	112.4	112.4	19	154.8	154.8	79	197.3	197.3
40	28.3	28.3	100	70.7	70.7	60	113.1	113.1	20	155.6	155.6	80	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	29.7	29.7	02	72.1	72.1	62	114.5	114.5	22	157.0	157.0	82	199.4	199.4
43	30.4	30.4	03	72.8	72.8	63	115.3	115.3	23	157.7	157 7	83	200.1	200.1
44	31.1	31.1	04	73.5	73.5	64	116.0	116.0	24	158.4	158.4	84	200.8	200.8
45	31.8	31.8	05	74.2	74.2	65	116.7	116.7	25	159.1	159.1	85	201.5	201.5
46	32.5	32.5	06	74.9	74.9	66	117.4	117.4	26	159.8	159.8	86	202.2	202.2
47	33.2	33.2	07	75.7	75.7	67	118.1	118.1	27	160.5	160.5	87	202.9	202.9
48	33.9	33.9	08	76.4	76.4	68	118.8	118.8	28	161.2	161.2	88	203.6	203.6
49	34.6	34.6	09	77.1	77.1	69	119.5	119.5	29	161.9	161.9	89	204.3	204.3
50	35.4	35.4	10	77.8	77.8	70	120.2	120.2	30	162.6	162.6	90	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	12	79.2	79.2	72	121.6	121.6	32	164.0	164.0	92	206.5	206.5
53	37.5	37.5	13	79.9	79.9	73	122.3	122.3	33	164.7	164.7	93	207.2	207.2
54	38.2	38.2	14	80.6	80.6	74	123.0	123.0	34	165.5	165.5	94	207.9	207.9
55	38.9	38.9	15	81.3	81.3	75	123.7	123.7	35	166.2	166.2	95	208.6	208.6
56	39.6	39.6	16	82.0	82.0	76	124.4	124.4	36	166.9	166.9	96	209.3	209.3
57	40.3	40.3	17	82.7	82.7	77	125.2	125.2	37	167.6	167.6	97	210.0	210.0
58	41.0	41.0	18	83.4	83.4	78	125.9	125.9	38	168.3	168.3	98	210.7	210.7
59	41.7	41.7	19	84.1	84.1	79	126.6	126.6	39	169.0	169.0	99	211.4	211.4
60	42.4	42.4	120	84.8	84.8	180	127.3	127.3	240	169.7	169.7	300	212.1	212.1
Dist	Dep	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 45 Degrees.

Table IV. Meridional Parts.

M	0d	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	11d	12d	13d	M
0	0	60	120	180	240	300	361	421	482	542	603	664	725	787	0
1	1	61	121	181	241	301	362	422	483	543	604	665	726	788	1
2	2	62	122	182	242	302	363	423	484	544	605	666	727	789	2
3	3	63	123	183	243	303	364	424	485	545	606	667	728	790	3
4	4	64	124	184	244	304	365	425	486	546	607	668	729	791	4
5	5	65	125	185	245	305	366	426	487	547	608	669	730	792	5
6	6	66	126	186	246	306	367	427	488	548	609	670	731	793	6
7	7	67	127	187	247	307	368	428	489	549	610	671	732	794	7
8	8	68	128	188	248	308	369	429	490	550	611	672	733	795	8
9	9	69	129	189	249	309	370	430	491	551	612	673	735	796	9
10	10	70	130	190	250	310	371	431	492	552	613	674	736	797	10
11	11	71	131	191	251	311	372	432	493	553	614	675	737	798	11
12	12	72	132	192	252	312	373	433	494	554	615	676	738	799	12
13	13	73	133	193	253	313	374	434	495	555	616	677	739	800	13
14	14	74	134	194	254	314	375	435	496	556	617	678	740	801	14
15	15	75	135	195	255	315	376	436	497	557	618	679	741	802	15
16	16	76	136	196	256	316	377	437	498	558	619	680	742	803	16
17	17	77	137	197	257	317	378	438	499	559	620	681	743	804	17
18	18	78	138	198	258	318	379	439	500	560	621	682	744	805	18
19	19	79	139	199	259	319	380	440	501	561	622	683	745	806	19
20	20	80	140	200	260	320	381	441	502	562	623	684	746	807	20
21	21	81	141	201	261	321	382	442	503	563	624	685	747	808	21
22	22	82	142	202	262	322	383	443	504	564	625	686	748	809	22
23	23	83	143	203	263	323	384	444	505	565	626	688	749	810	23
24	24	84	144	204	264	324	385	445	506	566	627	689	750	811	24
25	25	85	145	205	265	325	386	446	507	567	628	690	751	812	25
26	26	86	146	206	266	326	387	447	508	568	629	691	752	813	26
27	27	87	147	207	267	327	388	448	509	569	630	692	753	814	27
28	28	88	148	208	268	328	389	449	510	570	632	693	754	816	28
29	29	89	149	209	269	329	390	450	511	571	633	694	755	817	29
30	30	90	150	210	270	330	391	451	512	573	634	695	756	818	30
31	31	91	151	211	271	332	392	452	513	574	635	696	757	819	31
32	32	92	152	212	272	333	393	453	514	575	636	697	758	820	32
33	33	93	153	213	273	334	394	454	515	576	637	698	759	821	33
34	34	94	154	214	274	335	395	455	516	577	638	699	760	822	34
35	35	95	155	215	275	336	396	456	517	578	639	700	761	823	35
36	36	96	156	216	276	337	397	457	518	579	640	701	762	824	86
37	37	97	157	217	277	338	398	458	519	580	641	702	763	825	37
38	38	98	158	218	278	339	399	459	520	581	642	703	764	826	38
39	39	99	159	219	279	340	400	460	521	582	643	704	765	827	39
40	40	100	160	220	280	341	401	461	522	583	644	705	766	828	40
41	41	101	161	221	281	342	402	462	523	584	645	706	767	829	41
42	42	102	162	222	282	343	403	463	524	585	646	707	768	830	42
43	43	103	163	223	283	344	404	464	525	586	647	708	769	831	43
44	44	104	164	224	284	345	405	465	526	587	648	709	770	832	44
45	45	105	165	225	285	346	406	466	527	588	649	710	771	833	45
46	46	106	166	226	286	347	407	467	528	589	650	711	772	834	46
47	47	107	167	227	287	348	408	468	529	590	651	712	773	835	47
48	48	108	168	228	288	349	409	469	530	591	652	713	774	836	48
49	49	109	169	229	289	350	410	470	531	592	653	714	775	837	49
50	50	110	170	230	290	351	411	471	532	593	654	715	776	838	50
51	51	111	171	231	291	352	412	472	533	594	655	716	777	839	51
52	52	112	172	232	292	353	413	473	534	595	656	717	779	840	52
53	53	113	173	233	293	354	414	474	535	596	657	718	780	841	53
54	54	114	174	234	294	355	415	475	536	597	658	719	781	842	54
55	55	115	175	235	295	356	416	477	537	598	659	720	782	843	55
56	56	116	176	236	296	357	417	478	538	599	660	721	783	844	56
57	57	117	177	237	297	358	418	479	539	600	661	722	784	845	57
58	58	11	178	238	298	359	419	480	540	601	662	723	785	846	58
59	59	119	179	239	299	360	420	481	541	602	663	724	786	847	59

Table IV. Meridional Parts.

M	14d	15d	16d	17d	18d	19d	20d	21d	22d	23d	24d	25d	26d	27d	M
0	848	910	973	1035	1098	1161	1225	1289	1354	1419	1484	1550	1616	1684	0
1	849	911	974	36	99	63	26	90	55	20	85	51	18	85	1
2	851	913	975	37	1100	64	27	91	56	21	86	52	19	86	2
3	852	914	976	38	01	65	28	92	57	22	87	53	10	87	3
4	853	915	977	39	02	66	29	93	58	23	88	54	21	88	4
5	854	916	978	41	03	67	30	94	59	24	90	56	22	89	5
6	855	917	979	42	05	68	32	96	60	25	91	57	23	90	6
7	856	918	980	43	06	69	33	97	61	26	92	58	24	91	7
8	857	919	981	44	07	70	34	98	62	27	93	59	25	93	8
9	858	920	982	45	08	71	35	99	63	28	94	60	26	94	9
10	859	921	983	1046	1109	1172	1236	1300	1364	1429	1495	156	1628	1695	10
11	860	922	984	47	10	73	37	01	66	31	96	62	39	96	11
12	861	923	985	48	11	74	38	02	67	32	97	63	30	97	12
13	862	924	986	49	12	75	39	03	68	33	98	64	31	98	13
14	863	925	987	50	13	76	40	04	69	34	99	65	32	99	14
15	864	926	988	51	14	77	41	05	70	35	1500	67	33	1700	15
16	865	927	989	52	15	78	42	06	71	36	02	68	34	01	16
17	866	928	990	53	16	80	43	07	72	37	03	69	35	03	17
18	867	929	991	54	17	81	44	08	73	38	04	70	37	04	18
19	868	930	992	55	18	82	45	10	74	39	05	71	38	05	19
20	869	931	994	1056	1119	1183	1247	1311	1375	1440	1506	1572	1639	1706	20
21	870	932	995	57	20	84	48	12	76	41	07	73	40	07	21
22	871	933	996	58	21	85	49	13	77	43	08	74	41	08	22
23	872	934	997	59	22	86	50	14	79	44	09	75	42	09	23
24	873	935	998	60	23	87	51	15	20	45	10	77	43	10	24
25	874	936	999	61	25	88	52	16	81	46	11	78	44	12	25
26	875	937	1000	63	26	89	53	17	82	47	13	79	45	13	26
27	876	938	1001	64	27	90	54	18	83	48	14	80	47	14	27
28	877	939	1002	65	28	91	55	19	84	49	15	81	48	15	28
29	878	941	1003	66	29	92	56	20	85	50	16	82	49	16	29
30	879	942	1004	1067	1130	1193	1257	1321	1386	1451	1517	1583	1650	1717	30
31	880	943	05	68	31	94	58	22	87	52	18	84	31	18	31
32	881	944	06	69	32	95	59	24	88	53	19	85	52	20	32
33	883	945	07	70	33	96	60	25	89	55	20	86	53	21	33
34	884	946	08	71	34	97	61	26	90	56	21	88	54	22	34
35	885	947	09	72	35	99	62	27	92	57	22	89	56	23	35
36	886	948	10	73	36	1200	64	28	93	58	23	90	57	24	36
37	887	949	11	74	37	01	65	29	94	59	25	91	58	25	37
38	888	950	12	75	38	02	66	30	95	60	26	92	59	26	38
39	889	951	13	76	39	03	67	31	96	61	27	93	60	27	39
40	890	952	1014	1077	1140	1204	1268	1332	1397	1462	1528	1594	1661	1729	40
41	891	953	15	78	41	05	69	33	98	63	29	95	62	30	41
42	892	954	16	79	42	06	70	34	99	64	30	96	63	31	42
43	893	955	18	80	44	07	71	35	1400	65	31	98	64	32	43
44	894	956	19	81	45	08	72	36	01	67	32	99	66	33	44
45	895	957	20	82	46	09	73	38	02	68	33	1600	67	34	45
46	896	958	21	83	47	10	74	39	03	69	35	01	68	35	46
47	897	959	22	85	48	11	75	40	05	70	36	02	69	36	47
48	898	960	23	86	49	12	76	41	06	71	37	03	70	38	48
49	899	961	24	87	50	13	77	42	07	72	38	05	71	39	49
50	900	962	1025	1088	1151	1214	1278	1343	1408	1473	1539	1605	1672	1740	50
51	901	963	26	89	52	16	80	44	09	74	40	06	73	41	51
52	902	964	27	90	53	17	81	45	10	75	41	08	75	42	52
53	903	965	28	91	54	18	82	46	11	76	42	09	76	43	53
54	904	966	29	92	55	19	83	47	12	77	43	10	77	44	54
55	905	968	30	93	56	20	84	48	13	79	44	11	78	45	55
56	906	969	31	94	57	21	85	49	14	80	46	12	79	47	56
57	907	970	32	95	58	22	86	50	15	81	47	13	80	48	57
58	908	971	33	96	59	23	87	52	16	82	48	14	81	49	58
59	909	972	34	97	50	24	88	53	18	83	49	15	82	50	59

M	28d	29d	30d	31d	32d	33d	34d	35d	36d	37d	38d	39d	40d	41d	M
0	1751	1819	1888	1958	2028	2100	2171	2244	2318	2393	2468	2545	2623	2702	0
1	52	21	90	59	30	01	73	45	19	94	70	46	24	03	1
2	53	22	91	60	31	02	74	47	20	95	71	48	25	04	2
3	55	23	92	62	32	03	75	48	22	96	72	49	27	06	3
4	56	24	93	63	33	04	76	49	23	98	73	50	28	07	4
5	57	25	94	64	34	05	78	50	24	99	75	51	29	08	5
6	58	26	95	85	36	07	79	52	25	2400	76	53	31	10	6
7	59	27	96	66	37	08	80	53	27	01	77	54	32	11	7
8	60	29	98	67	38	09	81	54	28	03	78	55	33	12	8
9	61	30	99	69	39	10	82	55	29	04	80	57	34	14	9
10	1762	1831	1900	1970	2040	2111	2184	2256	2330	2405	2481	2558	2636	2715	10
11	64	32	01	71	41	13	85	58	32	06	82	59	37	16	11
12	65	33	02	72	43	14	86	59	33	08	84	60	38	18	12
13	66	34	03	73	44	15	87	60	34	09	85	62	40	19	13
14	67	35	05	74	45	16	88	61	35	10	86	63	41	20	14
15	68	37	06	76	46	17	90	62	37	11	87	64	42	22	15
16	69	38	07	77	47	19	91	63	38	13	89	66	44	23	16
17	70	39	08	78	48	20	92	65	39	14	90	67	45	24	17
18	72	40	09	79	50	21	93	66	40	15	91	68	46	26	18
19	73	41	10	80	51	22	94	68	42	16	93	69	48	27	19
20	1774	1842	1911	1981	2052	2123	2196	2269	2343	2418	2494	2571	2649	2728	20
21	75	43	13	83	53	25	97	70	44	19	95	72	50	29	21
22	76	45	14	84	54	26	98	71	45	20	96	73	51	31	22
23	77	46	15	85	56	27	99	72	46	21	98	75	53	32	23
24	78	47	16	86	57	28	2200	74	48	23	99	76	54	33	24
25	80	48	17	87	58	29	02	75	49	24	2500	77	55	35	25
26	81	49	18	88	59	31	03	76	50	25	01	78	57	36	26
27	82	50	20	90	60	32	04	77	51	27	03	80	58	37	27
28	83	52	21	91	61	33	05	79	53	28	04	81	59	39	28
29	84	53	22	92	63	34	07	80	54	29	05	82	61	40	29
30	1785	1854	1923	1993	2064	2135	2208	2281	2355	2430	2506	2584	2662	2742	30
31	86	55	24	94	65	37	0	82	56	32	08	85	63	43	31
32	87	56	25	95	66	38	10	83	58	33	09	86	65	44	32
33	89	57	27	97	67	39	11	85	59	34	10	88	66	46	33
34	90	58	28	98	69	40	13	86	60	35	12	89	67	47	34
35	91	60	29	99	70	41	14	87	61	37	13	90	69	48	35
36	92	61	30	2000	71	43	15	88	63	38	14	91	70	50	36
37	93	62	31	01	72	44	16	90	64	39	15	93	71	51	37
38	94	63	32	02	73	45	17	91	65	40	17	94	73	52	38
39	96	64	34	04	75	46	19	92	66	42	18	95	74	54	39
40	1797	1865	1935	2005	2076	2147	2220	2293	2368	2442	2519	2597	2675	2755	40
41	98	66	36	06	77	49	21	95	69	44	21	98	76	56	41
42	99	68	37	07	78	50	22	96	70	45	22	99	78	58	42
43	1800	69	38	08	79	51	24	97	71	47	23	2601	79	59	43
44	01	70	39	10	80	52	25	98	73	48	24	02	80	60	44
45	02	71	41	11	82	53	26	99	74	49	26	03	82	62	45
46	03	72	42	12	83	55	27	2301	75	51	27	04	83	63	46
47	05	73	43	13	84	56	28	02	76	52	28	06	84	64	47
48	06	75	44	14	85	57	30	03	78	53	30	07	85	66	48
49	07	76	45	15	86	58	31	04	79	54	31	08	87	67	49
50	1808	1877	1946	2017	2088	2159	2232	2306	2380	2456	2532	2610	2688	2768	50
51	09	78	48	18	89	61	33	07	81	57	33	11	90	70	51
52	10	79	49	19	90	62	35	08	83	58	35	12	91	71	52
53	11	80	50	20	91	63	36	09	84	59	36	14	92	72	53
54	13	81	51	21	92	64	37	11	85	61	37	15	94	74	54
55	14	83	52	22	94	65	38	12	86	62	38	16	95	75	55
56	15	84	53	24	95	67	39	13	88	63	40	17	96	76	56
57	16	85	55	25	96	68	41	14	89	64	41	19	98	78	57
58	17	86	56	26	97	69	42	16	90	66	42	20	99	79	58
59	18	87	57	27	98	70	43	17	91	67	44	21	2700	80	59

M	42d	43d	44d	45d	46d	47d	48d	49d	50d	51d	52	53d	54d	55d	M
0	2782	2863	2946	3030	3116	3203	3292	3382	3474	3569	3665	3764	3865	3968	0
1	83	64	47	31	17	04	93	84	76	70	67	65	66	70	1
2	84	66	49	33	18	06	95	85	78	72	68	67	68	71	2
3	86	67	50	34	20	07	96	87	79	74	70	69	70	73	3
4	87	69	51	36	21	09	98	88	81	75	72	70	71	75	4
5	88	70	53	37	23	10	99	90	82	77	73	72	73	77	5
6	90	71	54	38	24	12	3301	91	84	78	75	74	75	78	6
7	91	73	56	40	26	13	02	93	85	80	77	75	77	80	7
8	92	74	57	41	27	14	03	94	87	82	78	77	78	82	8
9	94	75	58	43	29	16	05	96	88	83	80	79	80	84	9
10	2795	2877	2960	3044	3130	3217	3306	3397	3490	3585	3681	3780	3882	3985	10
11	97	78	61	46	31	19	08	99	92	86	83	82	83	87	11
12	98	80	63	47	33	20	09	3400	93	88	85	84	85	89	12
13	99	81	64	48	34	22	11	02	95	90	86	85	87	91	13
14	2801	82	65	50	36	23	12	03	96	91	88	87	89	92	14
15	02	84	67	51	37	25	14	05	98	93	90	89	90	94	15
16	03	85	68	53	39	26	16	07	99	94	91	90	92	96	16
17	05	86	70	54	40	28	17	08	3501	96	93	92	94	98	17
18	06	88	71	55	42	29	19	10	03	98	95	94	95	99	18
19	07	89	72	57	43	31	20	11	04	99	96	95	97	4001	19
20	2809	2891	2974	3058	3144	3232	3322	3413	3506	3601	3698	3797	3899	4003	20
21	10	92	75	60	46	34	23	14	07	02	99	99	3901	05	21
22	11	93	76	61	47	35	25	16	09	04	3701	3800	02	06	22
23	13	95	78	63	49	37	26	17	10	06	03	02	04	08	23
24	14	96	79	64	50	38	28	19	12	07	04	04	06	10	24
25	15	97	81	65	52	40	29	20	14	09	06	06	07	12	25
26	17	99	82	67	53	41	31	22	15	10	08	07	09	14	26
27	18	2900	83	68	55	42	32	23	17	12	09	09	11	15	27
28	20	01	85	70	56	44	34	25	18	14	11	11	13	17	28
29	21	03	86	71	57	45	35	27	20	15	13	12	14	19	29
30	2822	2904	2988	3073	3159	3247	3337	3428	3521	3617	3714	3814	3916	4021	30
31	24	06	89	74	60	48	38	30	23	18	16	16	18	22	31
32	25	07	91	75	62	50	40	31	25	20	17	17	19	24	32
33	26	08	92	77	63	51	41	33	26	22	19	19	21	26	33
34	28	10	93	78	65	53	43	34	28	23	21	21	23	28	34
35	29	11	95	80	66	54	44	36	29	25	22	22	25	29	35
36	30	13	96	81	68	56	46	37	31	26	24	24	26	31	36
37	32	14	98	83	69	57	47	39	32	28	26	26	28	33	37
38	33	15	99	84	71	59	49	40	34	30	27	27	30	35	38
39	34	17	3000	85	72	60	50	42	36	31	29	29	32	37	39
40	2836	2918	3002	3087	3173	3262	3352	3443	3537	3633	3731	3831	3933	4038	40
41	37	19	03	88	75	63	53	45	39	34	32	32	35	40	41
42	39	21	05	90	76	65	55	47	40	36	34	34	37	42	42
43	40	22	06	91	78	66	56	48	42	38	36	36	38	44	43
44	41	24	07	93	79	68	58	50	43	39	37	38	40	45	44
45	43	25	09	94	81	69	59	51	45	41	39	39	42	47	45
46	44	26	10	95	82	71	61	53	47	43	41	41	44	49	46
47	45	28	12	97	84	72	62	54	48	44	42	43	45	51	47
48	47	29	13	98	85	74	64	56	50	46	44	44	47	52	48
49	48	31	14	3100	87	75	65	57	51	47	46	46	49	54	49
50	2849	2932	3016	3101	3188	3277	3367	3459	3553	3649	3747	3848	3951	4056	50
51	51	33	17	03	90	78	68	60	55	51	49	49	52	58	51
52	52	35	19	04	91	80	70	62	56	52	50	51	54	60	52
53	54	36	20	06	92	81	71	64	58	54	52	53	56	61	53
54	55	37	21	07	94	83	73	65	59	55	54	55	58	63	54
55	56	39	23	08	95	84	74	67	61	57	55	56	59	65	55
56	58	40	24	10	97	86	76	68	62	59	57	58	61	67	56
57	59	42	26	11	98	87	78	70	64	60	59	60	63	69	57
58	60	43	27	13	3200	89	79	71	66	62	60	61	64	70	58
59	62	44	28	14	01	90	81	73	67	64	62	63	66	72	59

M	56d	57d	58d	59d	60d	61d	62d	63d	64d	65d	66d	67d	68d	69d	M
0	4074	4183	4294	4409	4527	4649	4775	4905	5039	5179	5324	5474	5631	5799	0
1	76	84	96	11	29	51	77	07	42	81	26	77	33	97	1
2	78	86	98	13	31	53	79	09	44	84	28	79	36	5800	2
3	79	88	4300	15	23	55	81	12	46	86	31	82	39	03	3
4	81	90	02	17	35	57	84	14	49	88	33	84	41	06	4
5	83	92	04	19	37	60	86	16	51	91	36	87	44	09	5
6	85	94	06	21	39	62	88	18	53	93	38	89	47	11	6
7	86	95	08	23	41	64	90	20	55	95	41	92	50	14	7
8	88	97	09	25	43	66	92	23	58	98	43	95	52	17	8
9	90	99	11	27	45	68	94	25	60	5200	46	97	55	29	9
10	4092	4201	4313	4429	4547	4670	4796	4927	5062	5203	5348	5500	5658	5823	10
11	94	03	15	31	49	72	98	29	65	05	51	02	60	25	11
12	95	05	17	33	51	74	4801	31	67	07	53	05	63	28	12
13	97	07	19	34	53	76	03	34	69	10	56	07	66	31	13
14	99	08	21	36	53	78	05	36	71	12	58	10	68	34	14
15	4101	10	23	38	57	80	07	38	74	14	61	13	71	37	15
16	03	12	25	40	59	82	09	40	76	17	63	15	74	39	16
17	04	14	27	42	61	84	11	43	78	19	66	18	76	42	17
18	06	16	28	44	64	87	14	45	81	22	68	20	79	45	18
19	08	18	30	46	66	89	16	47	83	24	71	23	82	48	19
20	4110	4220	4332	4448	4568	4691	4818	4949	5085	5226	5373	5526	5685	5851	20
21	12	21	34	50	70	93	20	51	88	29	76	28	87	54	21
22	13	23	36	52	72	95	22	54	90	31	78	31	90	56	22
23	15	25	38	54	74	97	24	56	92	34	80	33	93	59	23
24	17	27	40	56	76	99	26	58	95	36	83	36	95	62	24
25	19	29	42	58	78	4701	29	60	97	38	85	39	98	65	25
26	21	31	44	60	80	03	31	63	99	41	88	41	5701	68	26
27	22	32	46	62	82	05	33	65	5102	43	90	44	04	71	27
28	24	34	47	64	84	07	35	67	04	46	93	46	06	74	28
29	26	36	49	66	86	10	37	69	06	48	95	49	09	76	29
30	4128	4238	4351	4468	4588	4712	4839	4972	5108	5250	5398	5552	5712	5879	30
31	30	40	53	70	90	14	42	73	11	33	5401	54	15	82	31
32	32	42	55	72	92	16	44	76	13	55	03	57	17	85	32
33	33	44	57	74	94	18	46	78	15	58	06	59	20	88	33
34	35	46	59	76	96	20	48	81	18	60	08	62	23	91	34
35	37	47	61	78	98	22	50	83	20	63	11	65	25	94	35
36	39	49	63	80	4600	24	52	85	22	65	13	67	28	96	36
37	41	51	65	82	02	26	55	87	25	67	16	70	31	99	37
38	42	53	67	84	04	28	57	90	27	70	18	73	34	5902	38
39	44	55	69	86	06	31	59	92	30	72	21	75	36	05	39
40	4146	4257	4370	4488	4608	4733	4861	4994	5132	5275	5423	5578	5739	5908	40
41	48	59	72	90	10	35	63	96	34	77	26	80	42	11	41
42	50	60	74	92	12	37	65	99	36	80	28	83	45	14	42
43	52	62	76	94	14	39	68	5001	39	82	31	86	47	17	43
44	53	64	78	95	16	41	70	03	41	84	33	88	50	19	44
45	55	66	80	97	18	43	72	05	43	87	36	91	53	22	45
46	57	68	82	99	20	45	74	08	46	89	38	94	56	25	46
47	59	70	84	4501	23	47	76	10	48	92	41	96	58	28	47
48	61	72	86	03	25	50	79	12	51	94	43	99	61	31	48
49	62	74	88	05	27	52	81	14	53	97	46	5602	64	34	49
50	4164	4275	4390	4507	4629	4754	4883	5017	5155	5299	5448	5604	5767	5937	50
51	66	77	92	09	31	56	85	19	58	5301	51	07	70	40	51
52	68	79	94	11	33	58	87	21	60	04	54	10	72	43	52
53	70	81	96	13	35	60	90	23	62	06	56	12	75	46	53
54	72	83	98	15	37	62	92	26	65	09	59	15	78	48	54
55	73	85	99	17	39	64	94	28	67	11	61	17	81	51	55
56	75	87	4401	19	41	66	96	30	69	14	64	20	83	54	56
57	77	89	03	21	43	69	98	33	72	16	66	23	86	57	57
58	79	91	05	23	45	71	4901	35	74	19	69	25	89	60	58
59	81	93	07	25	47	73	03	37	76	21	71	28	92	63	59

M	70d	71d	72d	73d	74d	75d	76d	77d	78d	79d	80d	81d	82d	83d	M
0	5966	6146	6335	6534	6746	6970	7210	7467	7745	8046	8375	8739	9145	9606	0
1	69	49	38	38	49	74	14	72	49	51	81	45	53	14	1
2	72	52	41	41	53	78	18	76	54	56	87	51	60	22	2
3	75	55	45	45	57	82	22	81	59	61	93	58	67	31	3
4	78	58	48	48	60	86	27	85	64	67	98	65	74	39	4
5	81	61	51	52	64	90	31	90	69	72	8404	71	82	47	5
6	84	64	54	55	68	94	35	94	74	77	10	78	89	55	6
7	86	67	58	58	71	97	39	98	78	83	16	84	96	64	7
8	89	70	61	62	75	7001	43	7503	83	88	22	91	9203	72	8
9	92	73	64	65	79	05	47	07	88	93	27	97	11	81	9
10	5995	6177	6367	6569	6782	7009	7252	7512	779	8099	8433	8804	9218	9689	10
11	98	80	71	72	86	13	56	16	98	8104	39	10	25	97	11
12	6001	83	74	76	90	17	60	21	7803	09	45	17	33	9706	12
13	04	86	77	79	93	21	64	25	08	15	51	23	40	14	13
14	07	89	80	83	97	25	68	30	13	20	57	30	48	23	14
15	10	92	84	86	6801	29	73	35	17	25	63	36	55	31	15
16	13	95	87	90	04	33	77	39	22	31	69	43	62	40	16
17	16	98	90	93	08	37	81	44	27	36	74	49	70	48	17
18	19	6201	94	96	12	41	85	48	32	41	80	56	77	57	18
19	22	05	97	6600	15	45	89	53	37	47	86	63	85	65	19
20	6025	6208	6400	6603	6819	7049	7294	7557	7842	8152	8492	8860	9292	9774	20
21	28	11	03	07	23	52	98	62	47	58	98	76	9300	83	21
22	31	14	07	10	26	56	7302	66	52	63	8504	83	07	91	22
23	34	17	10	14	30	60	06	71	57	68	10	89	15	9800	23
24	37	20	13	17	34	64	11	76	62	74	16	96	22	09	24
25	40	23	17	21	38	68	15	80	67	79	22	8903	30	17	25
26	43	26	20	24	41	72	19	85	72	85	28	09	38	26	26
27	46	30	23	28	45	76	23	89	77	90	34	16	45	35	27
28	49	33	27	31	49	80	28	94	82	96	40	23	53	44	28
29	52	36	30	35	53	84	32	98	87	8201	46	30	60	52	29
30	6055	6239	6433	6639	6856	7088	7336	7603	7892	8207	8552	8936	9368	9861	30
31	58	42	37	42	60	92	40	08	97	12	58	43	76	70	31
32	61	45	40	46	64	96	45	12	7902	18	64	50	83	79	32
33	64	49	43	49	68	7100	49	17	07	23	71	57	91	88	33
34	67	52	47	53	71	04	53	22	12	29	77	63	99	97	34
35	70	55	50	56	75	08	58	26	17	34	83	70	9407	9906	35
36	73	58	53	60	79	12	62	31	22	40	89	77	14	15	36
37	76	61	57	63	83	16	66	36	27	45	95	84	22	24	37
38	79	64	60	67	86	20	71	40	32	51	8601	91	30	33	38
39	82	68	63	70	90	24	75	45	37	56	07	98	38	42	39
40	6085	6271	6467	6674	6894	7128	7375	7650	7942	8262	8614	9005	9445	9951	40
41	88	74	70	77	98	32	84	54	48	67	20	12	53	60	41
42	91	77	73	81	6901	36	88	59	53	73	26	18	61	69	42
43	94	80	77	85	05	40	92	64	58	79	32	25	69	78	43
44	97	83	80	88	09	45	97	68	63	84	38	32	77	87	44
45	6100	87	83	92	13	49	7401	73	68	90	44	39	85	9996	45
46	03	90	87	95	17	53	06	78	73	95	51	46	93	10005	46
47	06	93	90	99	20	57	10	83	78	8301	57	53	9501	10015	47
48	09	96	94	6702	24	61	14	87	83	07	63	60	09	10024	48
49	12	99	97	06	28	65	19	92	89	12	69	67	17	10033	49
50	6115	6303	6500	6710	6932	7169	7423	7697	7994	8318	8676	9074	9525	10043	50
51	18	06	04	13	36	73	27	7702	99	24	82	81	33	10052	51
52	21	09	07	17	40	77	32	06	8004	29	88	88	41	10061	52
53	24	12	11	20	43	81	36	11	09	35	95	96	49	10071	53
54	27	15	14	24	47	85	41	16	14	41	8701	9103	57	10080	54
55	30	19	17	28	51	89	45	21	20	47	07	10	65	10089	55
56	33	22	21	31	55	94	49	25	25	52	14	17	73	10099	56
57	36	25	24	35	59	98	54	30	30	58	20	24	81	10108	57
58	40	28	28	38	63	7202	58	35	35	64	26	31	89	10118	58
59	43	32	31	42	66	06	63	40	40	69	33	38	98	10127	59

OF THE LATITUDES AND LONGITUDES OF THE PRINCIPAL HARBOURS AND CAPES IN THE WORLD;

With the TIMES of HIGH WATER where it is known.—The Longitude is reckoned from the Meridian of London.—Places marked thus *, are by Celeſtial Obſervations, others not ſo marked, are from the beſt Charts and Maps compared with theſe.

The Coaſt of England from London to the Land's End.	Lat. D. M.	Long. D. M.	H. W. H.
* LONDON	51 32N.	0 0	2 46
* Green. Obſ.	51 29	0 5E.	
Woolwich	51 30	0 9	
Purfleet	51 30	0 19	
Graveſend	51 27	0 28	
Rocheſter	51 23	0 38	
Nore	51 28	0 51	12 ⅓
N. Foreland light	51 25	1 32	11 ¾
S. Foreland lights	51 12	1 30	10 ½
* Dover	51 8	1 24	11 ¼
Dungeneſs	50 52	1 5	10 ½
Haſtings	50 53	0 47	10 ¾
Beachy Head	50 44	0 26	10 ¼
Shoreham	50 47	0 11W	9 ¼
Arundel	50 46	0 26	9 ¼
Selſey Bill	50 43	0 41	9 ½
Owers, S. E. Part	50 36	0 36	9 ½
* Portſmouth To. Iſle of Wight.	50 47	1 0	11 ¼
* Bembridge Ledge or Point	50 40	0 59	11 ¾
* Dunnoſe	50 33	1 10	9
* Saint Catherine's Point	50 30	1 14	9
* Needle's Lts.	50 41	1 24	9 ½
Pool Harbour	50 42	2 5	9
St. Alban's Head,	50 37	2 8	7 ⅓
* Weymouth	50 37	2 30	6 ¼
Portland Lights	50 31	2 31	7 ¼
Exmouth Bar	50 37	3 18	6 ⅔
Torbay, Berry Head	50 22	3 22	6 ½
Dartmouth	50 18	3 33	6 ¼
* Start Point	50 9	3 40	6 ¾
Praul ditto	50 8	3 47	6
* Eddyſtone Li.	50 8	4 18	5 ½
Hand Deeps	50 11	4 22	5 ½

	Lat. D. M.	Long. D. M.	H. W. H.
Ram Head	50 18N.	4 15W	5 ¾
* Plymouth	50 22	4 10	6 ¼
Fowey	50 17	4 47	5 ½
* Deadman's Pt.	50 12	4 54	5 ¼
* Falmouth	50 8	5 5	5 ⅓
Manacles Rocks	50 2	5 6	5
Black Head	50 5	5 10	5
* Lizard Point	49 57	5 14	5
Mount's Bay	50 8	5 37	5
Runnel Stone	50 2	5 43	5
Wolf Rock	49 56	6 30	4 ¾
Land's End	50 6	5 55	4 ½
Scilly Iſlands, S. part	49 52		
* St. Agnes Lts. Scilly	49 54	6 42	4 ¾
* St. Mary's, do.	49 57	6 36	4 ¾

The current in the mid. channel is N. E. about 1 H. 30 M. after high water; and it runs off Dungeneſs 4 H. to 4 and an half hours; in the Downs 4 hours; and eaſt in the King's channel, 3 hours after high water.

The following table ſhews the time of high water at the principal headlands, &c. in the Channel, on full and change days, and the time the current runs after high water.

The current runs after H. W.

High Water.	H. M.	H. M.	And the time the current has done running.	H. M.
At the Lizard at	5 0	3 0		8
Off the Eddiſtone	5 30	3 0		8 30
Off the Start	6 10	2 30		8 30
Off Portland	7 15	3 0		10 15
Off I. of Wight	8 14	3 15		11 30
Off Arundel and Shoreham	9 15	1 15		10 30
Off Beachy	9 45	1 15		11
Off Dungeneſs	10 30	4 0		2 30

NOTE. H. W. ſtands for high water; R. for river; I. for iſland; P. for point, and C. for cape.

NOTE. The variation in the Engliſh, and St. George's channels, is 25° 30′, and on the eaſt coaſt of England 25° weſt, and the Orkneys and Shetland iſlands about 2½ points, on the weſtern coaſt of Ireland 2¼ points weſt, and is found to vary between 11 and 12 minutes weſterly every year, or a degree in 5½ years, therefore, by adding a degree for every 5½ years to the variation here given for 1795, you will have the variation nearly for any ſucceeding year.

From the North Foreland to Duncan's Bay Head.

	Lat. D. M.		Long. D. M.		H. W. H	
*North Foreland	51	25N.	1	32E.	11	¾
Kentish Knock	51	43	1	45	11	½
Long Sand Head	51	48	1	45	11	½
Galloper N. P	51	58	2	0	12	
Ditto South P.	51	48	1	59	12	
Shipwash N. P.	52	9	1	43	12	
Ditto South P.	52	2	1	39	12	
Gabbard	52	5	1	45	12	
Orfordness ...	52	13	1	40	10	½
Aldboro' knaps, South P. ...	52	15	1	49	9	¾
Southwold	52	28	1	37	9	
Leoftaff Lights	52	38	1	49	9	
*Yarmouth	52	39	1	45	8	¼
Winterton Ness Lights	52	49	1	40	8	¼
Smiths Knowl	52	57	2	20		
Haisborough Sand, S. P.	52	54	1	48	7	½
Ditto, North P.	53	6	1	32	7	½
Cromer Lights	53	3	1	16	9	
Lemon and Ower, North P.	53	23	1	43		
Ditto, South P.	53	13	1	45		
Cromer Bank	53	21	1	30		
Dudgeon Lights	53	26	1	0	7	½
Outer Dowsings	53	40	1	0		
Inner Dowsings	53	22	0	50	5	½
Lynn Deeps ..	53	0	0	27	6	
Spurn Lights ..	53	41	0	22	5	¼
* Flamborough Head	54	10	0	7	4	½
Filey Brig	54	17	0	5W	4	½
Scarborough ..	54	21	0	13	4	½
Robin Hood's Bay	54	30	0	22	3	¾
Whitby	54	34	0	27	3	¾
River Tees' Mouth, Stockton	54	41	0	59	3	½
River Tyne's Mouth, Newcastle	55	2	1	9	3	½
Coquet Island	55	22	1	21	2	½
Staples Islands	55	39	1	40	2	½
Holy Island	55	42	1	48	2	½
Berwick	55	47	2	1	2	½
St. Abb's Head	55	57	2	6	4	½
Dunbar	55	59	2	29	2	
May I. Lights	56	11	2	32	4	½
*EDINBURGH	55	58	3	9	2	½
Fife Ness	56	15	2	33	4	½
Mouth of Tay	56	27	2	38	3	½
C. Rock, off do.	56	29	2	22	3	½
Red Head ...	56	38	2	28	3	
Montrose ...	56	44	2	24	1	½
New Aberdeen	57	7	2	4	12	¾
Peter Head ..	57	34	1	42	12	
Buchan Ness .	57	31	1	42	12	
Kinnaird's Head	57	39	1	56	12	
Bamff	57	38	2	27	11	½
Fort St. George	57	38N.	4	1W	11	¼
Inverness ...	57	28	3	45	11	½
Cromartie ...	57	42	3	50	11	¾
Tarbetness ...	57	54	3	44	11	¼
Caithness ...	58	20	3	3	11	
Nose Head ..	58	28	3	4	11	
Duncansby Head	58	40	3	3	11	½

The Orkney Islands

Pentland Skerries ...	58	45N.	2	57W	11	½
Stromo ..	58	45	2	59	11	½
South Renaldsha, South P.	58	47	2	52	11	½
Copinsha ..	58	53	2	41	11	½
Lambs Head, on Stronsal I.	59	4	2	29	11	
North Ronaldsha, North P.	59	23	2	22	10	½
Mould Head, on Patra Westra Island ..	59	21	2	52	9	
Noup Head, on Westra I.	59	18	3	2	9	
Marwick Head, on Pomona I.	59	6	3	16	10	
Hoy Head, on Hoy Wells I.	58	55	3	18	10	
Slue Skerry	59	3	3	24	10	
Fair Island ..	59	30	1	42	4	

The Shetland Islands.

Sumbug Head, South Point	59	52N.	1	15W	4
Rose or Hanglift	60	9	0	58	4
Brassa Sound Larwick	60	13	0	51	4
Out Skerries	60	25	0	18	4
Walsey Isle .	60	25	0	46	4
Unset, N. E. P.	60	47	0	15	4
Foul Island .	60	25	1	50	3

Ferro Islands.

The Munk Rock appears like a Ship under Sail	61	18N	6	47W	3
Fulae I. N. part of Ferro ..	62	12	6	27	4
East Point of Mygenes Isl. N. W. part of Ferro ...	62	3	7	32	4

From Duncan's Bay Head to the Land's-End.

Duncansby Head	58	40N.	3	3W	11	½
Dunnet Head	58	44	3	18	11	½
Faront Head	58	36	5	0	11	½
Cape Wrath, or Barre Head	58	36	5	20.	7	
A Rock 3 feen at ½ Ebb ...	58	45	5	21	7	

	Lat. D. M.	Long. D. M.	H. W. H.
Bara I.	58 54N	6 26W	
Rena Iſland ..	58 55	6 15	7
Rockal	57 28	13 32	
St. Kilda	57 51	8 56	
Butt of the Lewis	58 19	6 34	5 ½ ¼
Gallan Head	58 10	7 24	4 ¼
Flannan I. ..	58 13	7 50	4 ¼
Hiſkere I. ...	57 23	7 58	5
Bara Head ...	56 56	7 44	5 ½
Rocks very dangerous	56 55	7 7	5 ½ ½
Cana Iſlands ..	57 3	6 52	5
Hyſker Iſlands	56 56	6 58	5 ½ ½
Rum. I. Weſt P.	56 59	6 46	5 ½
Tircey I. S. P.	56 30	7 12	5
Colt I. North P.	56 42	6 45	5
Bomſhly Rocks	56 9	7 5	5 ½
Skerryvore ...	56 17	7 22	5 ½ ½ ½
Ila I. S. W. P.	55 47	6 44	10 ½ ½
Ditto, South P.	55 39	6 30	10 ½
Rachlan I. E. Part	55 17	6 17	9 ¼
Mull of Cantire Light-Houſe	55 21	6 0	11
I. of Arran, S. E. Part	55 32	5 20	11
Cumray I. Entrance of Clyde	55 47	5 17	11
Iſa I.	55 16	5 24	11
Irwin ...	55 36	5 0	11 ¼ ¾ ¾ ¼
Air	55 26	4 57	11
Loch Ryan ...	55 3	5 21	11 ½
Port Patrick Lts.	54 48	5 20	11
Mull of Galloway	54 37	5 8	11
Great Scar I.	54 40	4 57	11
Burrow Head ..	54 41	4 39	11
Solway Firth ..	54 47	4 30	11 ½
St. Bee's Head Light	54 30	3 50	11 ½ ½
Whitehaven ..	54 32	3 47	11
Selker Rock ..	54 16	3 39	11
Lancaſter	54 3	3 3	11 ¼ ¼ ½
Liverpool ...	53 27	3 12	11
Great Orms Hd.	53 20	4 3	10
Skerries Light	53 25	4 50	9 ¼ ¾ ¼ ½
Holyhead	53 19	4 52	9
Brachy Pool Hd.	52 47	4 57	7
Bardſey I. ...	52 45	5 0	7 ½
Barmouth ...	52 48	4 12	8
Cardigan Harbour	52 12	4 47	7 ¼
Strumble Head	52 0	5 10	7
St. David's Head	51 55	5 20	6
Ramſay I.	51 48	5 22	6
Small's Light-Houſe	51 48	5 36	9
St, Ann's ditto			
Milford Haven	51 44	5 10	5 ½
Worms Head	51 35	4 22	5 ½ ¼
Caldy I.	51 43	4 42	5 ¼
Lundy I. Entrance of Briſtol Channel	51 15	4 44	5 5
Mort P. S. Entrance of ditto	51 15N.	4 15W	5 ½ ½ ¼ ¼ ¼ ½ ½ ½

Table V. Of Latitudes and Longitudes.

	Lat. D. M.	Long. D. M.	H. W. H.	
Broad Haven	54 15N.	10 29W	5	
Stag Rocks, off Broad Haven	54 21	10 24	5	
Down Patrick Head	54 18	9 58	5	
Sligo Bay	54 15	9 18	5	¼
Ennis Murray I.	54 24	9 18	5	
Donegal Bay	54 30	9 6	5	½
Tillon Head	54 38	9 25	5	½
Arranmore	54 58	9 8	5	½
Tory Island	55 15	8 48	4	½
Lock Swilly	55 17	8 0	5	
Malin Head	55 24	7 48	4	
Enniſtrahul Rocks	55 29	7 35	4	
Iniſhoan Head, Entrance of Londonderry	55 16	7 16	4	
Bengore Head	55 18	6 44	4	
Racklin I. Weſt Point	55 21	6 32	8	
Fair Head	55 15	6 22	10	½
The Maid's Rocks	54 55	5 46	10	½
Belfaſt Loch	54 43	5 45	10	½
Copeland Lights	54 41	5 33	10	½
St. John's P.	54 12	5 49	11	
Dundrum	54 13	6 0	11	
Carlingfordloch	54 0	6 12	10	½
Dundalk	53 57	6 27	10	½
Drogheda Bar	53 45	6 22	11	
St. Patrick's I.	53 36	6 10	11	
Lambay Iſland	53 31	6 7	11	
DUBLIN	53 22	6 22	11	¾
Wicklow Lights	52 59	6 7	10	
Wexford	52 22	6 30	8	½
Tuſker Rock	52 12	6 14	8	½
Carnſore P.	52 11	6 23	8	½
The Saltee Rocks	52 5	6 36	5	½
Hook Lights, Waterford Harbour	52 3	7 3	4	½
Dungarvon	51 59	7 36	5	
Helwick Head	51 57	7 36	5	
Youghall	51 50	7 53	5	
Cork Harbour	51 41	8 23	4	
Kinſale Harbour	51 34	8 42	4	
Old Head of Kinſale	51 30	8 42	4	
Seven Heads	51 27	8 52	4	
Dundedy Head	51 25	9 8	4	
The Stags, off Toe Head	51 19	9 23	4	
Baltimore Harbour	51 20	9 46	4	

From Calais to Scaw.

	Lat. D. M.	Long. D. M.	
* Calais	50 57N.	1 57E.	
Gravelines	51 0	2 15	
* Dunkirk	51 2	2 28	
* Newport	51 8	2 51	
* Oſtend	51 14	3 2	
Walcheren I. Weſt P.	51 32	3 26	
Goree I.	51 53N.	3 58E.	
Schowen I.	51 47	3 43	
* North Gatt	52 1	4 9	
* Rotterdam	51 56	4 34	
* AMSTERDAM	51 23	4 51	
Texel	53 10	4 52	
Bremen	53 23	10 28	
Elbe River, Entrance of	54 4	10 1	
Hilige Land Light	54 11	7 48	
Holmen	57 1	8 38	
Robſnout	57 30	8 42	
Scaw	57 42	10 3	

From the Scaw to St. Peterſburgh.

	Lat. D. M.	Long. D. M.	
* Naze of Norway	57 59N.	6 41E.	
Fer Light	59 5	10 8	
Chriſtiana	59 50	10 20	
Frederickſtad	59 10	10 35	
Paternoſters	57 54	11 32	
Marſtrand Light	57 54	11 40	
Wingo Beacon	57 38	11 42	
Gothenburgh	57 42	11 45	
Leſſou I. Eaſt P.	57 20	11 9	
Weſt P.	57 17	10 51	
Trindelen Rock	57 28	11 15	
Kummel Bank	57 27	11 21	
Nidigen Light	57 18	12 1	
Warberg	57 7	12 19	
Falkenburgh	56 54	12 34	
Halmſtad	56 40	12 56	
Halland's I. Wadero	56 26	12 36	
Koll Light	56 19	12 33	
Anholt Light	56 44	11 36	
Haſelo I.	56 12	11 48	
Hielm I.	56 10	10 54	
Cronenburgh Light	56 3	12 42	
* Elſeneur	56 1	12 41	
Huen I. North P.	55 55	12 44	
* Lenſdſcrone	56 8	12 5	
* COPENHAGEN	55 41	12 41	
Saltholm, North P.	55 41	12 51	
Falſtrebo Light	55 21	12 53	
Lubek	53 51	10 50	
Dars Head	54 18	12 40	
Bornholm I. N. E. P.	55 19	14 54	
S. W. P.	54 57	15 17	
* Dantzick	54 22	18 40	
Oland, North P.	56 11	16 29	
South P.	57 24	17 9	
Gotland, North P.	56 55	18 16	
South P.	57 55	19 37	
Goltſke I.	58 16	19 27	
Memel	55 42	21 6	
Swaferort Lights	57 55	22 1	
Domes Neſs Light	57 48	22 30	
Runoe Light	57 49	23 12	
Riga	57 2	23 45	
Dogerort Light	58 56	22 3	
Hengo Light	59 49	23 2	
* STOCKHOLM	59 21	18 9	
* St. Peterſburgh	59 56	30 25	

From the Naze to Archangel.

	Lat. D. M.	Long. D. M.
* The Naze	47 59N.	6 41E.
Judder, or Walbert's Hd.	58 34	5 55
Lister Land	58 9	6 45
Rutt's I.	58 42	5 58
Great Wylingsoe Light-House	58 56	5 50
Stavanger	58 56	6 5
Ulster's I.	59 54	5 20
Bergen	60 12	5 50
Mus Sound	60 18	5 30
Sillewoog I.	60 36	5 21
Kate Nose	61 25	5 42
* Dronthemn, Var. 2 P. West	63 26	11 10
* Werro, I. Var. 1½ P. West	67 43	9 7
North Cape, Var. 1 P. West	71 10	26 10
Fishers I. Var. 1 P. W.	70 2	32 5
Kildume I. Var. ¾ P. West	69 18	33 45
* River Kola, Entrance, Var. ½ P. West ...	69 13	33 35
Sweetnose, Var. ½ P. W.	68 0	37 30
Orlogenose	67 0	39 23
Crofs I. Var. ½ P. W.	66 19	38 50
Ponoy R. Var. ½ P. W.	66 58	39 46
* Archangel, Var. ¼ P. West	64 30	39 0
Catnose, or Blue Point	65 21	38 12
C. Bona Fortune	66 23	40 28
C. Candinose	68 22	41 25
Weigate's Straits	69 30	62 2
Nova Zembla ...	78 0	70 0

Coasts of France, Spain and Portugal, from Calais to Gibraltar.

	Lat. D. M.	Long. D. M.	H. W. H.
* Calais ...	50 58N.	1 57E.	3 ¼
Cape Griz Nez	50 58	1 40	3 ¼
Boulogne	50 44	1 44	
Etaples	50 31	1 47	
St. Vallery ...	49 52	0 47	
* Dieppe	49 55	1 10	11
Fechamp ...	49 50	0 30	11
* Havre de Grace	49 29	0 12	9
Mouth of the Seine ...	49 27	0 10W	9
Caen	49 11	0 16	11
Cape Barfleur Lights ...	49 44	1 7	10 ½¼
Cherbourg ...	49 38	1 32	7 ¼
C. St. Germain	49 46	1 52	9
Alderney I. W. Point ...	49 48	2 12	9
Casket Lights	49 48	2 25	10
Guernsey I. W. Point ...	49 32	2 36	
Stark I. N. Point	48 28	2 17	
Jersey I. N. W. Point ...	49 16	2 17	6
* Coutance ...	49 3	1 21	6
* Granville ...	48 50	1 31	6

	Lat. D. M.	Long. D. M	H. W. H.
* Avranche ..	48 41N.	1 17W	6 ½
* St. Malo ...	48 39	1 56	6 ½
Cape Frehel ...	48 48	2 22	
St. Brieux	48 32	2 48	
De Brahat I.	48 52	2 52	7 ½
Roche Blanche	48 59	3 52	7 ½
* St. Anthony's Lights ...	48 40	4 24	6
* Ushant, W. Pt.	48 29	4 58	4 ½
* Brest	48 23	4 25	3 ¾
Point Raz	48 2	4 40	
Point L'Abbe	47 48	4 11	
Isles de Glenan	47 44	4 0	
L'Orient	47 44	3 21	
Isle de Groa ...	47 36	3 28	
Guiberon ...	47 34	3 5	
* Belle Isle ...	47 17	3 1	2 ½
Houat Isle	47 20	2 57	
Dumet Isle ...	47 15	2 52	
* Nantes	47 13	1 25	
Nourmoustier I.	47 2	2 10	
Dieu Isle ...	46 42	2 16	
* Roche Bon	46 14	2 21	4 ½
Ree Isle	46 15	1 28	3 ½¾
* Rochelle ...	46 9	1 4	3 ¾
* Rochfort ...	46 3	0 53	
Oleron Isle ...	46 3	1 19	
Cordovan Light House	45 36	1 6	4 ½
* Bourdeaux ..	44 50	0 30	3
C. Feret	44 43	1 10	
* Bayonne ...	43 29	1 24	3 ½
C. Machicaco	43 31	3 15	
Bilboa ...	43 15	3 1	3
C. de Lata ..	43 34	3 53	
C Penas	43 48	5 48	3
* C. Ortegal ..	43 46	7 36	3
C. Prior	43 31	8 8	3
Ferrol ...	43 30	8 0	3
Corunna ...	43 17	8 12	3
C. Belem	43 10	9 13	3
C. Turiana ...	43 4	9 21	3
* C. Finisterre	42 52	9 14	3
Vigo Bay	42 14	8 34	3 ½
C. Fasilis ...	42 5	8 50	3
* Oporto ...	41 20	8 21	3
C. Mondego ...	40 5	8 46	3
C. Fiseraon ...	39 24	9 10	3
The Burlings	39 20	9 31	3
* The Rock of Lisbon ...	38 45	9 31	3
* Lisbon ...	38 42	9 7	3 ¼
C. Epichel ...	38 21	9 15	3
St. Ubes	38 29	9 0	3
* C. St. Vincent	37 2	8 56	3
C. St. Mary ...	37 0	7 55	3
P. Avenisla ..	37 6	6 53	3
* Cadiz	36 31	6 6	2 ½
C. Trafalgar	36 10	5 56	3
* Gibraltar ..	36 5	5 16	3
Ceuta	35 50	5 12	3 ½
* C. Spartel ..	35 48	5 48	3

The North Coast of the Mediterranean Sea, from Gibraltar to Constantinople.

	Lat. D. M.	Long. D. M.
* Gibraltar	36 5N.	5 15W
Malaga	36 42	4 15
* Cape de Gatt	36 46	2 24
* Carthagena	37 37	1 2
* Cape Pallas	37 34	0 58
Alicant	38 25	0 9
Cape St. Martin	38 47	0 5E.
Gandia	39 1	0 6W
Valentia	39 30	0 32
Cape Gropeso	40 0	0 7
River Ebro	40 44	0 30E.
* Barcelona	41 26	2 18
Cape Sebastian	41 48	3 15
Cape de Creux	42 18	3 23
Perpignan	42 30	2 57
Cette	43 24	3 46
Narbonne Road	43 0	2 55
Montpelier	43 37	3 49
Mountfort	43 39	5 0
* Marseilles	43 18	5 28
* Toulon	43 7	6 3
Cape Taillar	43 4	6 56
Cape de Oropes	43 29	7 21
Villa France	43 42	7 25
Cape de Mille	43 54	7 56
* Genoa	44 25	8 41
Point de Fino	44 16	9 0
* Leghorn	43 27	10 27
Cape M. Nero	43 18	10 0
Vada	43 15	10 35
Piombino	43 0	10 33
Point Ercore	42 29	11 1
* Civita Vecchia	42 5	11 52
* Rome	41 54	12 35
Cape Dazzia	41 38	12 35
* Naples	40 51	14 20
Cape Polonado	40 3	15 28
Policastro	41 17	15 53
Cape Batican	38 47	16 35
Cape Grose	38 17	16 16
Cape Spartevento	38 0	16 57
Cape Collonia	39 0	18 8
Tarento	40 14	18 2
Galipoli	39 56	18 36
Cape St. Mary, the Entrance to the Gulf of Venice	39 40	19 14
Brinici	40 38	18 45
Barry	41 4	17 18
Manfredonia	41 40	16 10
Cape Vestio	41 43	16 34
Pescara	43 13	14 30
* Ancona	43 38	13 37
Comago	44 25	12 0
* Venice	45 26	12 10
Trieste	46 0	13 34
Rovigno	45 11	13 48
St. Maria	45 23	14 25
Pescera	44 42	15 40
Cape Sesto	43 45	16 25
Rosaro	42 48N.	17 40E.
Patero	42 23	19 15
Dorazo	41 40	18 45
La Vallona	40 55	20 8
Cape Liqueta	40 42	19 50
Pageni	39 19	21 28
Larta	38 55	22 3
Cape de Larta	38 40	21 44
Lepanto	38 15	22 54
Cape Gallo	36 40	21 49
Cape Mantapan	36 35	22 37
Cape St. Angele	36 37	23 44
Cape Mala	37 34	24 13
Corinth	38 10	23 35
* Athens	38 4	23 58
Negropont	38 28	24 10
Cape Doro	38 0	25 0
Cape St. George	39 10	23 44
* Salonica or Salonique	40 41	23 14
Cape Ballouri	39 43	23 55
Cape Pellice	39 57	24 25
Cape Monte Santo	40 10	24 57
Adrianople	40 44	27 5
Galipoli	40 25	27 11
*CONSTANTINOPLE	41 1	29 0

The South Coast of the Mediterranean Sea.

Ceuta	35 50N.	5 14W
C. Tetuan	35 28	5 14
C. Negril	35 25	4 24
* C. 3 Forcas	35 38	2 45
C. Fegalle	36 46	1 2
* C. Falcon	36 6	0 44
C. Ferrat	36 4	0 3E.
C. Tenois	36 35	1 12
* Algiers	36 49	2 19
C. Matifor	36 52	3 3
* C. Carbon	36 53	4 15
C. Tènes	37 4	5 44
C. Fyel	36 58	6 37
C. Ferro	37 4	7 33
Bona	36 45	7 53
Tabarca	37 8	8 55
C. Serra	37 25	9 35
C. Blanc	37 30	9 35
Tunis	36 45	10 10
C. Bon	37 9	11 8
Sufa	35 44	10 50
C. Paul	35 5	11 15
Cape de Zoara	33 30	11 24
* Tripoli	32 54	13 11
Magra	32 29	15 0
C. Mensurato	32 24	15 39
C. Lorat	31 0	16 30
C. Studico	31 43	17 37
Santores	30 17	18 40
C. Linconta	30 57	18 10
C. Sarabion	31 28	19 1
Zoara	31 12	19 0
C. Bengaza	32 28	20 2
C. Razat	33 7	22 20
Derne	32 59	22 21
C. Razatin	32 45	22 57

	Lat. D. M.	Long. D. M.
C. Luco	32 15N.	25 25E.
C. Soliman	31 40	25 45
P. Ramitan	31 25	26 27
C. Lagofego	31 13	27 19
C. Capopero	31 3	28 49
C. Rofe	31 0	29 40
* Alexandria	31 11	30 22
C. Brule	31 44	31 34
Domiata	31 36	32 1
Berella	31 20	32 47
C. Gallo	31 34	33 55
Jaffa	32 5	35 10
M. Carmel	32 50	35 16
C. Vardo	34 18	35 57
Tripoly	36 46	36 24
Tortofa	35 20	36 25
C. Saudin	36 0	36 0
C. Canzin	36 24	35 47
* Alexandretta, or Scanderoon	36 35	36 26
Aleppo	35 45	37 26
C. Urico	36 35	34 20
P. Cavelero	36 33	33 17
C. Dranmont	36 23	32 7
Satalia	36 58	30 35
C. Blanc	36 21	30 21
C. Seven Capes	36 31	28 54
C. Baibe	36 44	28 10
C. Crio	36 45	27 34
C. Petrera	37 10	27 30
C. St. Mary	37 45	27 20
C. Blanc	38 16	26 32
* Smyrna	38 28	27 27
C. Baba	39 24	26 20
C. Janefari	39 53	26 32
C. Capitani	40 13	28 0
Pruffias	40 35	29 4

Islands within the Straits.

* Alboran	36 1N.	2 48
Zaffarine Islands	35 23	2 8
Formentera, W. Point	38 41	0 49E.
Ditto, E. ditto	38 39	1 10
Ivica, S. ditto	38 48	0 51
Ditto, N. E. ditto	39 10	1 11
Salina	38 50	0 40
Carbera, S. Point	39 10	2 23
Majorca, S. Point	39 18	2 30
Ditto, N. ditto	40 45	2 40
Ditto, W. ditto	39 40	1 51
Ditto, E. ditto	39 42	3 2
Minorca, S. ditto	39 43	3 50
* Minorca, St. Philip's Fort	39 51	3 54
Ditto, N. ditto Point	40 16	3 21
Sardinia, S. W. Point	39 4	8 18
Ditto, S. E. ditto	39 0	9 54
Ditto, N. ditto	41 15	8 55
Ditto, N. W. ditto	40 57	8 2
Senera, N Point	41 13	8 6
St. Pelem	39 0	8 5
Tovo	38 40	8 20
Galite	37 50	8 55
Elba	42 48	9 50

	Lat. D. M.	Long. D. M.
Planofo	42 34N	9 45E.
Capraia	43 10	9 35
Gorgona	43 24	9 21
Pouza	42 32	9 55
Lufterca	38 53	13 35
Strombolo	38 57	15 52
Louaze	38 10	12 20
Marclimo	38 0	12 11
Faugnana	37 56	12 26
Sicily, W. Point	38 11	12 40
Ditto, S. ditto	36 45	15 36
Meffina in ditto	38 15	15 59
Pantelaria	36 54	12 0
Linofa	35 55	12 38
Piduffa	35 40	12 40
Malta, N. Point	36 0	14 22
Ditto, S. ditto	35 39	14 35
* The Harbour in Malta	36 0	14 34
Gozo, N. Point	36 12	14 50
Corfu, S. E. Point	39 31	20 50
Fano, Entrance of the Gulf of Venice	40 8	21 6
Pelegofa	42 14	16 30
Piani	42 9	16 13
Tremilli	42 10	15 50
Liffa	42 47	16 27
Pomo	43 2	15 55
Longa, S. E. Part	43 55	15 52
Scio, S. Point	38 14	26 32
Cerigo, S. Point	36 22	23 21
Cerigotte	35 55	24 43
Milo	36 41	25 6
Martelene, W. Point	39 15	27 12
Goze	35 2	24 5
Candia: S. W. Point	35 17	23 56
Candia: Cape Spada	35 45	24 18
Candia: S. E. Point	35 21	23 55
Candia: N. E. Point	35 35	27 6
Rhodes, S. E. Point	35 27	18 45
Cyprus, W. Point	35 0	31 55
E. Point	35 40	35 0
S. Point	34 30	33 16

The Coaft of Africa from Cape Spartel to Cape Verd.

* Cape Spartel	35 48N.	5 47W
* Larafh	35 11	6 8
* New Sale	32 35	6 38
* Mazagan	33 15	8 11
* Cape Blanco	33 5	8 20
* Cape Cantin	32 35	9 0
* Sama Bay	32 20	8 40
* Mogadore Iſland	31 27	9 25
* Cape Geer	30 28	9 47
Santa Cruz	30 29	9 34
Cape Nun	28 40	11 10
* Cape Bajador	26 29	14 20
* Cape das Barbas	22 15	16 34
* Cape Blanco	20 41	16 52
Arguin	20 22	16 22
Cape Miric	19 15	16 16
Portendic	18 6	16 58
Senegal Bar	15 51	16 9
* Cape Verd	14 46	17 47

The Weſtern Iſles.

	Lat. D. M.	Long. D. M.
* Corvo	39 42N.	31 9W
* Flores	39 34	29 54
* Fayal, the Town	38 32	28 37
* Pico	38 29	28 20
Tercera	38 54	28 15
St. George	38 39	27 55
Gracioſa	39 2	28 4
* St. Michael, E. Point	37 47	25 48
Ditto, W. Point	37 50	26 48
* St. Mary	37 0	25 6

The Madeiras.

* Porto Santo	32 58N.	16 20W
Rock E. of ditto, under water	33 30	16 2
Madeira, Eaſt P.	32 50	16 46
Ditto, Weſt P.	32 30	17 26
* Funchal in ditto	32 38	17 5
The Salvages Iſlands	30 8	16 4

The Canaries.

* Manzarote, North P.	29 25N	13 26W
* Ditto, South P.	28 51	13 41
Forteventura, Weſt P.	28 4	14 26
Ditto, Eaſt P.	28 40	13 40
* Canaria, N. E. P.	28 13	15 33
* Ditto, South P.	27 42	15 54
* The Peak of Teneriffe	28 13	16 26
* Ditto, North P.	28 39	16 0
* Orotavia in ditto	28 23	16 30
Santa Cruz in ditto	28 27	16 18
Palma, North P.	28 36	17 32
Tazicote in ditto	28 6	17 3
Ditto, Sonth P.	28 18	17 37
Gomera, at the Port	28 6	17 4
* Ferro, the Town	27 47	17 40
* Ditto, Eaſt P.	27 50	17 37
Ditto, Weſt P.	27 46	17 32

Cape Verd Iſlands.

St. Antony	17 9N	24 48W
St. Vincent	16 50	24 36
St. Lucia	16 44	24 31
St. Nicholas	16 32	24 16
* Sal	16 38	22 50
* Bonaviſta	16 6	22 41
* Mayo	15 10	23 0
St. Jago, North P.	14 54	23 27
Ditto, South P.	14 17	23 25
Brava	14 50	24 39
* Fogo	14 57	24 22

From Cape Verd to the Cape of Good Hope.

	Lat. D. M.	Long. D. M.
* Cape de Verde	14 46N.	17 47W
* Goree Iſle	14 36	17 37
Cape Naze	14 24	17 18
Cape St. Mary, Entrance to the River Gambia	13 17	16 56
Cape Roxo	12 23	17 10
Cape Vergue	9 52	14 56
Delos Iſles	9 29	14 7
* Cape Sierra Leon	8 29	13 48
* Cape Ann	7 7	13 27
* Cape Mount	6 46	11 42
* Cape Mezurado	6 16	11 17
Cape Baxos	5 28	10 7
Seſtos River	5 27	9 47
Cape Formoſa	5 8	9 39
* Cape Palmas	4 26	8 15
St. Andrew's River	4 58	6 20
Cape Maho	5 12	5 12
* Cape Appollonia	4 59	3 11
* Axim	4 52	2 36
* Cape Three Points	4 40	2 38
* Dix Cove	4 48	2 22
* Sakondee	5 0	1 59
* Elmina	5 10	1 40
* Cape Corſe Caſtle	5 12	1 28
* Devil's Hill	5 24	0 50E.
* Anamaboe Fort	5 10	1 7
* Acra	5 30	0 16
* Barracoe	5 53	1 29
River Volta	5 53	1 25
Cape St. Paul	5 52	1 40
Whidah	6 25	3 13
Formoſa River	5 33	6 10
Cape Formoſa	4 30	6 40
New Callabar River	4 23	8 0
Cameron River	3 20	10 0
Cape St. John	1 15	9 23
Gabon River	0 0	9 23
C. de Lopas Gonſalvez	0 47S.	9 12
Seſto River	2 16	9 35
Alvary Bay	3 27	10 40
Congo River	4 35	11 5
Ambris River	6 45	12 0
Cape Ledo	9 50	12 3
St. Philip de Benguela	12 18	12 35
* Cape Negro, appears like black hommocks	16 27	12 44
* Tiger's Iſland	16 30	12 0
Cape Frio	18 40	13 42
* Elizabeth's Bay	26 12	15 30
Cape Roſtro de Pedro	23 0	14 0
* Angra Pequena	26 35	15 40
Cape das Voltas	29 0	16 45
* Walwick Bay, N. W. Point	23 0	14 0
Cap Deſcada	32 20	15 24
* St. Helen's Bay, C. St. Martin's	32 45	17 45
* Saldanah Bay	33 8	18 0
* Cape of Good Hope	34 29	18 29

Islands between Cape Verd, the Cape of Good Hope, and Cape Horn.

	Lat. D. M.	Long. D. M.
St. Paul's	0 54N.	26 40W
* Ferdinand Noronka	3 56S.	32 32
St. Matthew	1 33	7 30
Fernand de Po, N. P.	3 23N	8 50E.
Princes I.	1 44	8 0
* St. Thomas, Man of War's Bay	0 27	7 0
* Ditto, South P.	0 5	6 50
* Annabona	1 28S.	5 52
* Trinidad	20 15	30 30W
* Aſcenſion	7 56	14 16
* St. Helena, James Town	15 55	5 46
Saxemburgh	30 41	19 15
* Triſtau da Cunha	37 10	13 20
Diego Alvarez	39 20	11 2
* Gough's Iſland	40 3	2 30
Falkland I. N. E. P.	51 50	63 30
Ditto, S. W. Point	51 0	66 5
* Iſland of Georgia	54 30	37 30

From the Cape of Good Hope to Canton in China.

* Cape of Good Hope	34 22S.	18 20E.
Falſe Cape	34 16	18 50
Cape Aguillis	34 44	20 15
* Falſe Bay	34 10	18 39
Bay St. Braze	34 28	21 59
Cape Talhado	33 27	24 7
* Algoa Bay	33 30	26 35
Cape Delgado, Muſcle B.	33 38	24 10
* Firſt P. of Natal	32 11	28 51
* Middle P. Natal	30 45	30 20
Port Natal	29 50	30 57
Smoaky Cape	27 7	32 15
Cape St. Mary, Entrance of Delagoa Bay	25 51	33 16
Cape Corlantes	23 37	36 35
Cape St. Sebaſtian	21 35	36 25
Sofalo	20 15	35 32
Angoxa	16 11	39 27
Juoda	21 29	39 26
* Mozenbique	14 56	40 29
Cape Delgado	10 6	41 15
Giuloa	8 41	39 40
Mombas	3 34	41 30
Melinda	2 45	41 47
* Magadoſha	2 20N	46 25
Cape Baſſas	4 50	49 2
* Cape Orfui	10 27	51 38
* Cape Guardafui	11 47	51 35
* Cape Babelmandel, Entrance of the Red Sea.	12 38	43 47
* Cape Fartaſh	15 29	52 5
* Cape Aden	12 45	45 17
Cape Morebet	17 16	54 19
* Socotra I. Eaſt Point	12 18	54 23
Ditto, Weſt Point	12 45	53 2
* Cape Pedro	17 54	55 27
* Loka in the Red Sea	13 17	43 17
Cape Iſoclette	19 4N.	57 18E.
Great Mazeira I.	20 15	58 31
Cape Roſelgate	22 36	59 54
Muſcat	23 30	58 16
Cape Jaſk	25 57	57 15
C. Muſeldon, Entrance to the Gulf of Perſia	26 17	56 17
Cape Birdiſtan	28 0	51 8
Gambaroon	27 18	56 6
Cape Monze	25 0	66 18
* Baſſora	30 31	47 32
* Point Gigat	23 30	68 35
Diau Point	20 44	69 50
Cambaye	23 36	72 17
Surat	21 10	72 26
Cape St. John	20 6	72 34
* Bombay	18 57	72 43
Dabul	18 0	73 29
* Goa	15 31	73 55
Barcelore	13 53	75 2
Mangalore	13 0	75 35
Mount Dilly	12 5	75 35
* Cochin	9 53	76 27
* Cape Comorin	7 57	77 32
Dondra Head, South P. of Ceylon	5 47	81 2
* Trincomaley B.	8 35	81 27
Point Pedro	9 57	80 39
Point Calymere	10 13	79 54
* Negapatnam	10 32	79 53
* Pondicherry	11 42	79 59
* Fort St. David's	11 29	79 54
* Madras	13 5	80 35
Point Divy	16 2	81 29
* Maſulipatnam	16 16	81 24
* Coringa Bay	16 58	82 30
* Point Gordeware	16 45	82 37
* Viſagapatam	17 46	83 35
* Gamjum	19 25	85 7
* Jagernaut Pagoda	19 48	85 57
* Black Pagoda	19 51	86 10
Falſe Point	20 17	86 51
* Point Palmyras	20 44	87 10
* Kadgiree	21 43	88 56
* Balaforce	21 21	87 21
* Ingellee	21 50	88 11
* Calcutta	22 34	88 33
* Chandernagor	22 51	88 35
* Iſlamabad	22 20	91 52
Aracau River	20 17	93 0
Cheduba Iſle	18 45	93 37
* C. Négrais	16 8	94 9
* Gulf of Martaban	15 37	96 30
* Tavay Point	14 37	97 44
* Junkſeylon	8 15	98 2
* Malacca	2 12	102 11
* Cape Romania	1 15	104 5
* Siam, in the Gulf of Siam	14 18	100 55
* Cambaja Point	8 45	103 45
Avarella Point	12 54	107 50
* Pulo Canton	15 15	107 15
G. Nord or Turon	16 4	116 30
* Macao	22 13	113 52
* Canton	22 8	113 8

Iſlands lying between the Cape of Good Hope and Cape Cameron.

	Lat. D. M.	Long. D. M.
St. Paul's Iſland	37 31 S	77 56E.
Amſterdam	38 15	78 0
* South P. Cape St. Mary's	25 33	44 55
North P. C. Ambro or Natal	12 2	50 19
* St Auguſtin's B.	23 35	43 30
C. St. Vincent	21 46	43 37
C. St. Andrew's	16 6	45 32
C. St. Sebaſtian	12 30	49 44
Bay Antongil	16 0	50 38
I. St. Mary	16 54	50 36
* Foul Point	17 41	49 59
* Fort Dauphin	25 0	47 5
Baſſas de India	22 20	41 30
Europa Rocks	21 30	40 17
Juan de Nova	17 15	43 7
Suſſex Rocks	21 29	42 26
Bazaruto Rocks	21 16	36 30
Engliſh Bank	17 30	39 27
Cheſterfield ſhoal	16 17	44 0
* Mayotto I.	12 47	45 30
* Mohilla I.	12 30	43 55
* Johanna I.	12 15	44 35
* Comoro	11 32	43 30
Portugueſe ſhoals	12 33	46 55
John Martin's I.	10 9	43 15
Aldabra Iſlands	9 40	46 45
Aſſumption I.	9 46	47 37
Coſmoledo I.	9 46	48 38
S. Peter's I.	9 34	50 47
Natal I.	8 30	47 15
Sandy I.	9 16	48 12
Zanzibar I.	6 10	40 45
Amirante I N.W.P.	5 10	53 45
S E.P.	6 30	55 0
Mahe I. N.W.P.	3 50N.	54 5
S E P.	5 20S.	56 30
* Iſle Bourbon	20 52	55 36
* Mauritius	20 10	57 35
* Diego Rais, or Rodrigue	19 40	63 10
* St. Brandon	16 34	62 50
Nazareth Bank, S. W. Point	16 45	60 0
N. E. Point	13 35	61 44
Sandy Iſland	15 10	55 5
* South Requepiz	10 30	54 32
John de Nova	10 15	53 30
Providence I.	9 15	53 32
St. Francis Iſles	7 10	50 30
Peros Banhos	5 30	72 20
* Diego Garcia	7 30	72 35
Candu Iſles	6 0N.	76 35
Adu Iſles	5 30	76 20
Maldive Iſles, S. E. P.	0 40S.	74 55
N.W.P.	7 15N	73 40
Malique Iſlands	8 15	73 29
Laccadive Iſles, S.E.P.	10 0S.	72 45
N.W.P.	12 36N.	72 25

Madagaſcar.

Iſles Eaſt of Cape Comorin.

	Lat. D. M.	Long. D. M.
* Ceylon, S. Point	5 47N.	81 2E
* N. Point	9 57	80 39
* Trincomaley in ditto	8 35	81 27
Bale of Cotton Rock	5 28	86 15
Preparis I.	14 50	93 35
Cocos I. North P.	14 21	93 10
* Great Andaman I. North P.	13 30	92 30
South P.	11 21	92 35
Little Andaman, S. P.	10 15	92 45
Nicobar Iſles, N. P.	9 25	93 7
South P	6 51	94 17
Seyers I.	7 35	95 30
Hog I.	2 30	95 45
Pooloo Nyas	0 57	97 2
Po Mintaon	0 25S.	97 45
Good Fortune I. S. P.	1 57	99 49
Engona	5 20	101 54
Poggy or Naſſau, S. P.	3 15	100 25
Trompeuſe	5 33	102 30
* Prince's I. Straits of Sunda	6 24	104 48
Bearings of a Rock on which the Indoſtar ſtruck in the Straits of Sunda.		
Zeeclip Weſt 5° North		
Pk. on Crocatoe S. 15° W.		
Peak on Tamarind I. N 6° W.		
Captain M'Intoſh rowed round the Rock in a Circle of ten Fathoms, and the Boat was never in leſs than ten Fathom Water.		
* Chriſtmas I.	10 30	104 27
Coco Iſland	21 45	98 30
* Java Head, or W. P.	6 45	104 55
* Eaſt P.	8 37	104 37
North Iſland	5 41	105 50
Peak on Crocatoa I.	6 8	105 14
Peak on Tamarin I.	6 54	105 18
Zeeclip	6 50	105 12
* Batavia in ditto	6 10	106 57
* Bally Straits, South Entrance	8 45	114 47
* Bally I. South Point	8 56	115 23
Lombock Straits	9 10	115 57
Straits of Maſs	9 0	116 50
Straits of Sapy	8 30	119 32
Sandal Wood I.	9 45	120 0
Rotto I.	11 15	123 7
Timor I. Weſt Point	10 15	123 43
* Pulo Runda	5 59	95 39
* Pulo Way	5 49	95 33
* Pulo Braſſe	5 38	95 21
* Pumatra, Weſt Point	5 25N	95 32
* Achen, in ditto	5 22	95 40
* Bencoolen, in ditto	3 49S.	102 6
* Eaſt Point	5 53	104 7

Islands in the China Seas to the Eastward of Java.

	Lat. D. M.	Long. D. M.
* Banca, North P.	1 33S.	116 0E.
South P.	3 4	106 17
* Lucepara, S. Entrance to the Straits of Banca	3 12	106 10
Monopin Hill	2 0	105 8
Billiton, S. E. Point	3 6	108 15
Pintang, E. Entrance to the Straits of Sincapore	0 18	105 15
Spirit Island	0 7N.	106 30
St. Julian's Island	0 45	106 38
Timelan Island	1 0	107 15
Victory Island	1 28	105 55
Wood I.	1 34	105 47
Saddle Island	2 17	105 44
Anambas Island	2 47	106 15
Natunas I.	4 5	108 10
* Pulo Timoy I.	2 30	105 52
* Pulo Aroe I.	2 30	104 42
* Pulo Timon I. S. P.	2 49	104 24
* Pulo Brata	4 45	103 30
Pulo Lazen	7 17	102 30
Ridang I.	6 20	102 37
* Pulo Uby	8 30	103 45
* Pulo Wav	10 0	102 34
Two Brothers	8 32	105 37
* Pulo Condor	8 41	106 10
* Pulo Sapata	10 4	108 42
Elephant	11 0	113 10
Pitt's I.	10 55	114 35
South Sea Caſtle I.	11 30	112 17
Paracels I. North P.	16 30	110 0
South P.	11 37	109 30
Macclesfield Bank, N. Point	16 6	114 10
South Point	15 15	114 20
Scarborough Rocks	15 0	117 12
Hainan North Point	20 2	110 15
South Point	18 12	109 20
* Formoſa, South P.	27 47	120 52
Pratas Rocks	20 30	116 15
Triangles Rocks, N P.	17 0	111 0
S. P.	16 0	111 32
* Borneo, S. W. Point	2 45S.	109 28
* S. E. Point	4 15	114 25
* W. Point	0 0	108 45
* E. Point	5 15N.	118 50
* N. Point	7 0	116 45
* Balambangan, Entrance to the Sooloo Sea	7 30	117 2
Banguey	7 17	117 30
Palawan, S. Point	8 28	117 30
N. Point	11 20	119 46
* Sooloo I. E. Point	5 57	121 21
Celebes, S. Point	5 42S.	120 6
N. Point	2 0N.	124 0
Luconia, N Point	18 45	120 45
* Manilla in Luconia	14 36	120 59
* Karkalang I. S. P.	3 52	126 14
N E. P.	4 29	126 20
* Moratay I.	2 28	127 30
* Gilolo I. N. Point	2 17N	127 20E.
* W. Point	1 8	127 1
* Heri I.	0 59	126 54
* Ternate I.	0 57	126 53
* Marizne I.	0 21S.	126 40
* Sutta Mangal I.	1 48	126 17
* Burro I. West P.	3 3	125 43
* Sutta Baſſie I.	2 36	125 41
* N. End of a dangerous Shoal off Bouton I.	5 25	122 8
* Bouton I. S. P.	5 42	121 11
* Toucca Baſſie I.	5 35	123 15
* Balataya I.	5 55	122 37
* Cambona I.	5 29	121 26
* Salayer Straits	5 44	120 6
* Celebes I. S. P.	5 42	120 6
N. P.		
N. W. P.		
Tonyn I.	5 27	118 2
Luciſiva I.		
Paternoſters in the Straits of Macaſſar		
Pulo Laut, S. P.		
* Great Solombo	5 28	113 8
* Lubeck I	5 47	112 12
* Carimon Java I.	5 48	110 10
Pulo Rachel I.	5 53	108 3

NOTE. In theſe Seas there are many thouſand Iſlands, ſo that it would be of no Uſe to lay them down here. Recourſe muſt be had to the beſt Chart.

New Holland.

S. W Cape.	43 42S.	146 5E
S. E. Cape.	43 46	147 5
* St. Maria's Iſles	43 20	148 10
* St. Patrick's Head	41 44	148 20
* Cape Howe	37 24	149 54
* Cape Dromedary	36 21	150 4
* Botany Bay	34 0	151 20
* Port Jackſon	33 47	151 21
* Cape Hawke	32 13	152 28
* Smoaky Cape	30 49	153 7
* Cape Danger	28 7	152 28
* Cape Morton	26 57	153 22
* Sandy Cape	24 45	153 2
* Keppel Bay	23 30	150 40
* Cumberland I.	20 30	148 45
* Cape Cleveland	19 10	148 5
* Cape Flattery	14 52	145 10
* Cape Conway	20 44	148 30
* Cape York	10 44	141 37
Van Diemen's Bay	10 30	130 15

New Guinea.

* Cape Faſe	8 40S.	136 30
Eaſt Point	6 20	148 0
* Louiſiade Iſles, E. P.	10 35	154 0
Weſt Point	1 30	148 30
* New Britain, Eaſt P.	4 53	153 9
Weſt Point	6 0	149 20
* New Ireland, Eaſt P.	5 0	152 30
Weſt Point	2 20	148 20

Rocks and Shoals lying West of New Holland.

	Lat. D. M.	Long. D. M.
A Rock above Water	28 17S.	98 30E.
Cloats Iſlands	21 45	93 27
Tryal Rocks	20 40	104 30
Roſemary I.	20 30	110 45
Abrolhos Shoals	28 30	111 45
Kerguellen's Land	28 41	96 4

Iſlands in the Pacific Ocean, lying between New Holland and Cape Horn.

Formoſa, South P.	22 5N	120 30E.
North P.	25 15	122 13
* Tayoan in Formoſa	22 40	120 20
Great Liqueo, S. P.	25 15	128 30
North P.	28 0	128 30
Xuno I. South P.	31 30	131 50
North P.	34 45	131 30
Niphon, South P.	33 30	135 0
North P.	41 0	142 0
Matooſmaee	42 30	140 30
* Kamtſcatka on the Main, South P.	51 0	156 30
Beering's I. South P.	54 0	161 30
Ladrone Iſles, Northernmoſt	21 0	114 6
Southernmoſt	8 0	114 6
* Peſcadore Iſles	10 30	164 0
Huahine I.	16 44S.	151 0W
St. Bartholemi	14 20N.	156 30
I. St. Pierre	11 0	178 45
Sandwich Iſles	17 41S	168 39E.
Northernmoſt	22 0	159 30W
* Owhyhee, South P.	20 0	155 30
* Queen Charlotte I.	19 18	138 4
* New Hebrides, Quiros C.	14 56	167 26E.
Northernmoſt	14 30	156 45
Southernmoſt	20 30	169 30
* Ballabea I.	20 7	164 48
* New Caledonia Pudgona	20 18	164 47
* C. Colenet	20 30	165 2
* Charlotte's Foreland	22 15	167 20
North P.	20 0	158 30
* C. Coronation	22 5	167 14
* Friendly Iſles, Northernmoſt	19 30	174 15W
Southernmoſt	21 30	175 10
* Society Iſles, N. W. end	17 30	152 0
* Otaheite, Oaitipeha B.	17 46	149 8
* Hood's I.	9 26	138 46
New Zealand.		
* Duſky Bay	45 47	166 24E.
* Palliſer's C.	41 38	175 24
* C. Farewell	40 37	172 47
* Turnagain C.	40 26	178 3
* North C.	34 10	167 10
* South C.	7 20	167 30
* Sandwich Land, N.P.	57 30S.	27 30W
* South ditto	60 0	27 27
South Georgia.		
C. Buller	53 58	37 40
C. Charlotte	54 32	36 11
C. Diſappointment	54 58	36 15
C. George	54 17	36 32
C. North	54 4	38 15
Sandwich Bay	54 42	36 12
Saunders Iſland	54 6	36 58
Wallis's Iſles	54 0	38 20

The Coaſt of Iceland.

Reikneſs C.	63 55N.	22 40W
Weſtman's I.	63 2	21 4
Palrixfiord	65 36	24 4
* Straumneſs	65 40	24 26
North Cape	66 34	23 5
Grims I.	67 0	21 41
* Rikefiord	67 0	17 30
Long Noſe	66 45	12 14
Balaneſs	66 2	12 16
Enchuiſon I.	65 0	10 0
Engelhoaſt	64 32	12 14
Wreeland I.	64 5	13 14
C. Hekla	63 22	16 49

The Coaſt of Greenland.

* John or Hanen's I.	71 10N.	9 44W
Gael Hamkes Bay	75 0	6 45
Bontekoe I.	73 27	9 30
Charn P.	70 5	22 17
Dangey I.	67 23	27 19
Herjons Neſs	65 3	30 19
Whales I.	62 30	39 3
C. Diſcord	60 50	39 55
C. Prince Chriſtian	59 55	41 30
* C. Farewell	59 38	42 38
C. Deſolation	62 0	46 7

Davis's Straits.

C. Reſolution	62 40N	46 38W
C. Comfort	62 45	47 30
Hope Harbour	63 55	47 50
Gilbert's Sound	64 15	47 53
Cooken Sound	64 50	47 58
K. Chriſtian's River	66 7	47 8
Muſketto Cove	64 55	52 51
Romel Fort	67 22	45 53
Diſco I. S. W. Point	69 6	44 38
Waygate I.	70 40	44 8
James's I. C. Bedford	68 30	50 8
Cumberland I. S. P.	66 0	60 30
Bay of Good Fortune	64 20	61 29
C. Elizabeth	62 5	64 30
Reſolution I. C. Warwick	61 4	64 30

Hudſon's Bay.

Button's Iſles	60 47N.	65 16W.
Lowe's Savage I.	61 48	66 20
Terra Nieva	62 4	68 0

	Lat. D. M.	Long. D. M.
Saddle Back I.	62 10N.	68 10W
Great Bear I.	54 4	79 56
Ice Cove	62 0	69 0
Baker's Dozen	57 0	-
Great Savage I.	62 25	70 0
North Bluff	62 26	71 10
God's Mercies	62 28	70 48
Salisbury I.	63 30	76 50
Nottingham, E. End	63 35	76 45
C. Charles, East End	62 50	74 15
West End	62 40	76 0
Burgeo Isles	47 36	57 36
C. Walsingham	62 40	78 0
C. Diggs	62 45	78 48
Mansfield, North End	62 40	78 0
South End	61 35	81 30
Sleepers I.	60 10	81 30
Great ditto	58 35	81 30
C. Pembroke	62 57	82 10
Large Swan's Nest	62 20	83 30
C. Southampton	62 10	86 10
Churchill River	58 47	94 7
Charlton I.	52 3	79 5
Port Nelson's Shoals	57 35	92 30
Hay River	57 10	93 0

From Hudson's Bay to Quebec.

Button's Islands	60 47N.	65 16W
Black Head	59 50	63 32
Half-Black Head	59 20	60 14
Cardinals I.	58 50	62 55
Steel-S.	58 7	61 45
Fair I.	57 45	61 15
Sadel Islands	57 13	60 45
Inchanted Cape	56 40	60 50
St. Peter's Harbour	56 28	60 45
C. Harrison	54 54	56 45
Great Bay of Eskimaux	54 20	57 30
C. Charles	52 13	55 25
York Point	51 57	55 52
Red Bay	51 44	61 25
Black Bay	61 40	56 42
Red Cliffs	51 33	56 45
Forteau Bay	51 30	56 55
Grand Point	51 24	57 12
Esquimeaux Bay	51 28	57 45
Haha Bay	50 52	59 2
Great Mecatina P.	50 42	59 8
Little Mecatina Islands	50 28	59 27
Mount Joli	50 5	61 30
Esquimeaux Islands	50 12	63 0
Mingan I.	50 16	63 15
Grand Bay, St. John's	50 22	64 0
The Seven Island Bay	50 7	65 45
Trinity Bay	49 37	66 27
St. Nicholas's Bay	49 28	67 0
Laval Bay	48 55	68 0
Bay of Rocks	48 5	68 38
St. Paul's Bay	47 30	69 10
Quebec	46 55	69 46

Newfoundland.

	Lat. D. M.	Long. D. M.
Belle Isle, Var, 20° 30′ West	51 55N.	55 25W
Quirpon Harbour	51 40	55 34
St. Anthony's Cape	51 17	55 39
Hare Bay	51 15	55 56
Groais I.	50 55	55 40
Green I.	50 47	55 30
Hooping Harbour	50 46	56 13
White Bay	50 15	56 20
Horse Islands	56 21	56 46
C. St. John	56 10	55 33
Bay of Notre Dame	50 0	55 30
Twillingate Islands	50 3	54 35
Fogo I.	50 0	53 49
Gander Bay	49 40	54 10
Wadham Islands	49 54	53 25
C. Freels	49 34	52 55
Funck I.	50 1	52 12
Barrow Harbour	48 50	53 0
C. Bonavista	48 52	52 35
Trinity Bay	48 30	53 0
P. of Grates	48 22	52 30
C. St. Francis	47 54	52 25
* St. John's Harbour	47 32	52 20
Great Burgeo I.	47 36	57 30
C. Spear	47 30	52 15
Bay of Bulls	47 21	52 24
C. Broyle	47 3	52 30
C. Pallard	46 49	52 37
C. Race	46 30	52 44
Virgin Rocks	46 30	50 18
C. Pine	46 40	53 15
St. Mary's Bay	46 50	53 30
C. St. Mary's	46 52	54 2
Bay of Placentia	47 0	54 30
Chapean Rouge	46 52	55 17
St. Peter's I.	46 36	56 6
Langley I.	46 42	56 15
Great Miquelon	46 55	56 16
Burnet	47 15	55 56
Fortune Bay	47 16	55 30
Penguin's Islands	47 24	57 0
Runney I.	47 32	57 25
Great Barrisuay	47 37	57 40
* Burges I.	47 32	57 37
C. Ray, Var 20° West	47 37	59 10
Cod Roy I.	47 52	59 18
C. St. George, Var. 19° W.	48 30	59 8
South Head	49 7	58 21
C. St. Gregory, Var. 22° 40′ West	49 22	58 12
Bay St. Paul	49 50	57 50
Ingornachoix Bay	50 38	57 22
St. John's I.	50 50	57 18
Point Ferolle	57 3	57 6
Bay St. Barbe	51 15	56 48
C. Norman	51 40	55 57
Limits of the Great Bank of Newfoundland, North P.	50 15	59 45
South P.	41 0	52 0
Outer Bank	47 0	45 0

The Gulf of St. Lawrence.

	Lat. D.M.	Long. D.M.
St. Paul's	47 11N.	59 55W
Bird Iſlands	47 55	60 36
Brion I.	47 52	60 55
Magdalen I. N. E. P.	47 41	60 55
S. W. ditto	47 12	61 36
Entry I.	47 15	61 15
Deadman's I.	47 15	61 48
I. of Anticoſta, E. P.	49 8	61 34
S. W. ditto	49 22	63 18
Weſt ditto	49 48	64 18
North ditto	49 53	63 58
I. de Bik, in the R. St. Lawrence	48 52	67 50
Mount Camille ...	48 37	67 15
C. St. Ann ...	49 3	66 0
Magdalen R. ...	49 13	65 18
C. Rozier ...	48 47	63 56
C. Gaſpe and Bay ..	48 41	63 53
Flat P.	45 34	63 53
I Bonaventure ..	48 28	63 53
C. Deſpair ...	48 24	64 1
Miſcou I. Entrance of Chaleur Bay ...	48 0	64 16
P. Eſcuminac ...	47 1	64 37
St. John's I. N. Cape	47 2	63 49
Weſt Point	46 34	64 11
Eaſt ditto	46 27	61 48
Bear Cape ..	46 0	62 13
Hilſborough Bay	46 6	62 55
C. St. George, or St. Lewis	45 51	61 44
Gut of Canſor, North Entrance ..	45 42	61 22
Juſtan Corp I. ...	45 56	61 22
Port Hood ...	45 57	61 20
C. North, I. off Cape Breton ...	47 1	60 10
Port Dauphin, ditto .	46 23	60 13
Spaniſh Bay, ditto	46 18	59 57
Flint I. ...	46 11	59 33
Scatari I. ...	46 2	59 27
C. Breton ..	45 57	59 39
Louiſburg	45 54	59 49
C. Hinchinbroke ..	45 34	60 24
I. Madam ...	45 29	60 44
Gut of Canſor, South Entrance ...	46 28	60 46
Chedabucto Bay ..	46 23	60 46

From Cape Canſor in Nova-Scotia to Cape Florida.

Sable I. Eaſt Point ..	44 8N.	59 55W
Weſt ditto	44 4	60 3
C. Canſor, Var. 15° W.	45 16	60 50
Port Howe ..	45 13	61 0
Torbay ..	45 12	61 11
Sandwich Bay ..	45 8	61 31
Port Stephens ..	45 0	61 53
Halifax Harbour ..	44 36	63 23
C. Sambro Light-Houſe	44 30	63 27
Charlotte Bay, Var. 14° Weſt ...	44 34N.	63 50W
Port Jackſon ..	44 13	64 22
Iſle of Hope ...	43 53	64 39
Port Roſeway ..	43 40	65 12
C. Sable, Var. 11° 15′ Weſt ...	43 27	65 30
Spal Iſles ...	43 27	65 55
C. Forchu ...	43 52	66 4
St. Mary's Cape, Var 11° 45′ Weſt ...	44 10	66 7
Breyer's I. Var. 11° 15′ Weſt ...	44 19	66 20
Anapolis Royal ..	44 47	65 43
Hauto I. ...	45 19	64 47
C. Chignecto, Entrance Baſon of Mines	45 44	25 44
C. Spencer ..	45 17	65 50
Mocgone's I. Entrance of St. John's River .	45 18	65 59
Wolf I. ..	45 3	66 40
Grand Manan I. South Point ..	64 43	66 50
Weſtern Seal Iſlands	44 37	66 47
Machois Bay ...	44 44	67 15
Gouldſborough Harbour	44 34	67 50
Mount Defert Rock	44 3	67 50
C. Ann Light-Houſe	42 51	70 4
Boſton Harbour ...	42 25	70 31
C. Cod ..	42 5	69 40
Caſhes Ledge, North P.	43 19	68 41
South P.	42 47	68 40
St. George's Bank, N. W. Part ...	41 42	68 5
Nantucket I. ...	41 1	69 30
Ditto Shoals, S.W.P	40 42	69 26
Martha's Vineyard I.	41 18	70 20
Noman's Land I.	41 12	70 25
Rhode I. Harbour	41 2	71 0
Block I. Middle	41 10	71 23
Montuck Point, Long I.	41 4	71 46
* Sandy Hook ...	40 25	74 0
* New York Harbour	40 43	74 5
* C. May ...	38 58	74 52
* C. Henlopen, Var. 6° Weſt ..	38 46	75 5
Philadelphia ...	39 57	75 7
Falſe Cape ...	38 30	75 6
C. Charles ..	37 11	75 9
C. Henry ..	36 57	76 4
C. Hatteras ...	35 16	75 54
Ditto Shoals, S.W.P.	34 54	75 24
C. Lookout ...	34 22	77 4
Shoals off ditto, S. Point	34 40	77 0
C. Fear	33 51	78 28
Frying-pan Shoals, off ditto, S. E. Part	33 30	78 17
George Town ...	33 27	79 24
Shoals off ditto ..	33 5	79 13
C. Roman ...	33 5	79 30
Charles-Town Light-Houſe ..	32 42	80 10
Savannah ..	32 3	81 24
Tybee Light ...	32 0	81 10

	Lat. D.M.	Long. D.M.
Port Royal	32 12N.	80 54W
River St. John, Entrance	30 18	81 30
Auguſtine Bay	29 47	81 21
C. Caneveral	28 20	80 45
Shoals off ditto	28 20	80 40
C. Florida	25 44	80 44
I. of Bermudas, Saint George's Town	32 45	63 30
N.W. Point	32 25	60 25
S.W. Point	32 11	63 40

NOTE. This Iſland is ſurrounded with dangerous Rocks at ſix or ſeven miles diſtance, eſpecially on the North ſide.

From Cape Florida to Cape Horn.

* C. Florida	25 44N.	80 44W
* Dry Tortugas Shoals, S.W. Point	24 32	83 40
C. Sable	24 57	81 52
C. Roman	25 42	82 36
* Charlotte Harbour	26 43	82 24
* Spiritu Santo Bay	27 36	82 54
Bay of Apalache	29 40	85 0
C. St. Blaze	29 35	85 44
Penſacola Bar	30 15	87 34
Mobile Point	30 11	88 35
* New Orleans	29 58	89 53
Mouth of R. Miſſiſippi	29 13	89 27
Mouth of Rio Brava	26 7	90 49
New St. Ander	23 46	90 27
C. Roxo	21 57	99 42
* Vera Cruz	19 12	97 24
Campeche	19 41	92 54
Praceles Shoals, N.P.	23 50	88 54
* C. Catoche	21 38	87 26
* Logerhead Key	21 38	87 14
Falſe C.	21 28	87 14
Cozumel I. S. Point	20 3	87 34
Oorth Triangles, S. P.	18 25	87 26
N. Point	19 5	87 17
Key Bokel	16 27	88 14
Glovers Reef, N. Part	16 52	87 47
S. ditto	16 33	88 17
Utilo, E. Point	16 11	87 27
Ratan I. E. Point	16 25	86 30
Bonacca I. N.E. Point	16 29	85 55
C. Honduras	16 1	86 9
C. Cameron	16 0	85 9
Black River	15 56	85 4
C. Djas-Gracias	15 1	82 50
Triangles, S. Part	16 30	79 55
N. ditto	17 0	80 53
Sand Key, N. Part	16 30	78 20
St. Andrew's I.	12 32	80 50
Corn Iſlands, N. Part	12 10	82 2
St. John's Point	10 33	82 50
* Porto Bello	9 33	79 44
Gulf of Darien	8 40	76 40
* Carthagena	10 27	75 21
* St. Martha	11 27	73 59
C. de la Vela	11 10	71 53
Monjes Iſlands	12 23N.	71 21W
C. Coquibacao	12 5	71 21
Aruba I. E. Point	12 9	69 25
Curaco I. N. Point	12 25	69 7
C. St. Roman	11 30	69 30
* Point Cabello	10 31	67 26
* Aves I.S. Part	11 54	67 13
Roca I.	11 45	66 17
Orchilla I.S. Part	11 44	66 3
Salt Tortuga, E. ditto	11 0	64 44
Blanca I. N. ditto	11 40	63 56
Margarita I. N.E P.	11 10	63 13
N.W. ditto	11 3	63 46
C. Three Points	10 19	62 25
Oroonoco River	8 25	59 26
Eſſequebo River	6 30	58 30
Surinam River	5 52	55 2
* Cayenne	4 56	52 10
C. North	1 48	49 57
Mouth of R. Amazon	0 18	51 30
St. Louis de Maranham	2 15S.	46 34
C. Baras	3 0	42 26
C. St. Roque	5 1	36 17
Pernambuca or Plende	8 0	35 0
C. St. Auguſtine	8 32	35 0
St. Francifco River	11 0	36 15
St. Salvadore	12 46	38 38
Porto Seguro	16 36	39 30
Abrolhos Banks	18 0	38 30
Eſpirituo Santo	20 0	39 45
C. St. Thome	21 51	40 20
C. Frio	22 35	41 15
* Rio Janeiro	22 54	42 38
Grande I.	23 15	43 30
Santos	24 4	45 30
St. Catherine's I.	27 15	49 0
Porto St. Pedro	31 44	55 17
* C. St. Mary, North Entrance to R. Plate	34 45	54 10
* C. St. Anthony, S. Entrance to ditto	36 31	58 27
* Buenos Ayres in ditto River, 14° Var. E.	34 35	58 25
C. La Matas	45 0	65 45
* C. Blanco	47 20	64 36
Bay St. Julian	49 10	68 38
Straits of Magellan	52 35	67 45
* C. Succeſs	55 1	65 21
C. St Diego	54 34	65 15
C. St. Anthony	54 47	64 53
C. St. Bartholomew	54 58	64 51
C. St. John	54 7	63 51
* C. Horn	55 8	67 20

The Weſt Coaſt of America from Cape Horn to Behring's Straits.

* Cape Horn	55 58S.	67 20W
* Barnwell's I.	55 49	66 52
* C. Diego	54 33	64 6
* Juan Fernandez I.	33 30	71 22
* Arica	18 29	71 5
* Conception Bay	36 43	72 34

	Lat. D. M.	Long. D. M.
* Lima	12 1 S.	76 43 W
Gallapagos Isles, Mid. Lat.	23 30	85 0
* Panama	8 48 N.	80 15
Aquapulco	17 10	101 40
C. Corientes	22 20	107 0
California, South Point	23 30	109 30
C. de Touche	45 24	125 5
C. Fitzhugh	51 0	128 57
C. St. James	52 0	131 34
C. Caldwell	54 18	133 31
C. Edgecumbe	57 3	135 47
* Nootka, or Saint George's Sound	49 36	126 42
* Pr. William's Sound	61 5	147 15
* Cook's River	59 0	152 0
C. Grevill	57 30	153 0
Alaska, S. Point	54 45	163 11
* Shallow-Water P.	63 0	162 45
C. Stephens	64 21	162 15
* Norton Sound	64 15	162 0
* C. Rodney	64 35	164 24
* C. Prince of Wales	65 45	168 13

Islands in the West Indies.

Trinidada, N. E. P	10 45 N.	60 36 W
Tobago, N. E. ditto	11 29	59 57
S. W. ditto	11 5	60 49
Grenada, N. E. P.	12 14	61 49
S. W. ditto	11 57	62 19
Grenada Bank, Middle	11 55	62 45
Barbadoes, S. Point	13 7	59 45
E. ditto	13 12	59 37
Bridge Town	13 9	59 51
N. W. Point	13 22	59 52
St. Vincent, N. Point	13 12	61 16
S. ditto	13 4	61 15
St. Lucia, S. Point	13 30	61 0
N. ditto	13 56	60 46
Martinico, S. E. Point	14 24	60 57
Dimond ditto	14 24	61 1
Port Royal	14 36	61 4
W. Point	14 25	61 14
N. E. ditto	14 58	61 0
Dominica, S. Point	15 15	61 20
N. ditto	15 29	61 25
Marigalante, N. E. P.	16 4	61 0
S. E. ditto	15 53	60 59
Guadaloupe, S. Point	15 54	61 43
N. ditto	16 30	61 42
Grandeterre, S. E. P.	16 15	61 4
N. ditto	16 41	61 25
Deserada, N. E. Point	16 24	60 56
S. W. ditto	16 18	61 3
Antigua, E. Point	17 3	61 45
Montserrat, N. E. P.	16 47	62 12
S. W. ditto	16 40	62 15
Redondo I.	17 3	62 20
Nevis	17 17	62 28
St. Christopher's, S. E. Point	17 16	62 31
N. W. ditto	17 26	62 42
St. Eustatia, the Town	17 29 N.	63 4 W
Saba	17 39	63 8
Aves I.	15 33	63 35
Berbuda, S. E. Point	17 50	61 45
St. Bartholomew, E. P.	17 56	62 34
W. ditto	17 54	62 51
St. Martin's, E. Point	18 3	62 50
W. ditto	18 40	63 7
Anguilla, N. E. Point	18 22	62 46
S. W. ditto	18 9	63 5
Prickley Pear	18 20	63 10
Sambero	18 26	63 21
Anegado, E. Point	18 36	63 50
W. ditto	18 41	64 1
St. Croix, E. Point	17 36	63 40
W. ditto	17 44	64 25
Virgin Gorda, E. Point	18 18	63 40
The Fort	18 18	63 54
Tortola, E. Point	18 21	64 27
W. ditto	18 18	64 39
St. John's, S. Point	18 5	64 40
St. Thomas, S. ditto	18 25	64 41
The Town	18 22	64 46
Porto Rico, N. E. Point	18 39	65 39
S. E. ditto	18 10	65 38
N. W. ditto	18 41	67 46
S. W. ditto	18 11	67 45
La Mona I.	18 10	68 24

Hispaniola, or St. Domingo.

Cape Engano	18 27	68 35
Soona I. E. Point	17 55	68 48
* Altavila Rock, off ditto	17 28	71 35
Abacou Point	18 2	73 48
* Port au Prince	18 40	72 10
C. Tiberon	18 20	74 31
* Fort St. Louis	18 19	73 15
Navaza I.	18 24	74 59
C. Dona Maria	18 38	74 22
* Petit Grove	18 27	72 49
C. Nicholas	19 50	73 25
* The Mole	19 49	73 25
Tortudos, E. Point	20 2	73 32
W. ditto	20 5	72 56
Monte Christo	19 56	71 39
* Old C. Francois	19 40	69 57
* C. Pamana	19 15	69 10
C. Raphael	18 56	69 0

Island of Jamaica.

Morant, S. E. End	17 58	76 10
* Port Royal	18 0	76 48
Portland Point	17 42	77 2
Carlisle Bay	17 50	77 15
Pedro Bluffs	17 52	77 35
Black River	18 5	77 40
Savannah la Mer	18 15	78 6
Negril Point	18 17	78 31
Montego Bay	18 33	77 52
St. Ann's Harbour	18 39	76 55
Porta Maria	18 32	76 35
Port Anthony	18 25	76 6

Islands and Shoals lying off Jamaica.

	Lat. D. M.	Long. D. M.
Morant Keys N.E.P.	17 26N.	75 55W
S. W. ditto	17 24	75 48
Formogas	18 31	75 39
Pedro Shoals, E. P.	17 20	77 1
Little Cayman, S. W. ditto	19 32	80 10
Great Cayman, S. W. ditto	19 11	81 8
N. ditto	19 18	
Swan I. S.W. ditto	17 12	83 30
Mesterioſa Shoal	18 0	83 50
A dry Bank	18 36	73 15
Pracel Shoal	18 50	84 20

Island of Cuba.

C. Mayze	20 16	74 4
St. Jago	20 12	75 35
Cumberland Harbour	19 53	75 13
Cabo de Cruz	19 42	77 52
I. of Pines, S. W. Point	21 20	83 12
C. Corientes	21 46	84 57
Middle Cape ..	21 44	84 34
Cape Antonio	21 49	85 15
Colorados Rocks N.W.P.	22 30	85 14
Havannah	23 12	82 12
Matanzas	23 12	81 15
Islands and Shoals North of Cuba and Jamaica		
Laſt Reef	20 12	68 43
North Reef S.E. Point	20 15	69 29
W. ditto ..	20 31	70 1
The Triangle	20 40	69 48
Square Handkerchief, N. E. Point	21 17	70 20
S.W. ditto	20 53	70 57
Grand Turk's I. N.E. ditto	21 32	71 5
Sand Key	21 11	71 10
The Great Cayos, S.P.	21 8	71 45
E. ditto	21 43	71 26
N.W. ditto	21 57	72 6

	Lat. D. M.	Long. D. M.
Heneaga, N.E. Point	21 20N.	72 59W
W. ditto	21 0	73 40
Little Heneaga, W. P.	21 30	73 8
N. ditto	21 34	74 0
Hogſtye's, the Middle ..	21 41	73 50
Mayaguana, S. Point	22 20	72 33
N. ditto	22 29	72 53
S. W. ditto ..	22 22	72 55
French Keys	22 42	73 27
Miraperoos Keys, S. P.	22 7	74 18
Caſtle I. or South Key	22 8	74 0
North Key, Crooked I.	22 49	74 2
Atwood's Key, N.E. P.	23 13	73 25
Key Verde, S.W. ditto	22 12	75 10
The Brothers	22 38	75 0
Long I. S.E. Point ..	22 50	74 45
N. ditto	23 30	75 28
Rum Key	23 33	74 57
Watland's I. S. Part ..	23 57	74 35
Little I. its Centre	24 4	74 30
Cat I. S. Part	24 4	74 44
N. ditto	24 39	75 12
Exuma, E. ditto	23 34	75 10
Eleuthera, Powel's Pt. or S. Part	24 45	76 10
Egg I. or W. Part	25 35	77 10
New Providence, W. P.	21 56	78 5
* Naſſau Town in ditto	25 4	77 45
W. P. of ditto	24 57	78 3
Andros I. S. Point	24 5	78 0
N. Point	25 15	78 30
Frozen Key	25 22	78 0
The Hole in the Wall	26 10	77 40
Little Bank of Bahama N. W. Point	27 45	79 44
Sandy Key	26 33	79 34
Great Iſaac	26 0	79 47
Little ditto	26 5	79 11
Cat Keys Harbour	25 10	79 36
Orange Key	24 43	79 36
Double-headed Shot Keys, W. Point	24 0	80 10
Key Sal	23 31	80 3
Anguilla, E. Part ...	23 22	78 43

Though this Table is more extenſive, and nearer the Truth than any publiſhed, it being deduced from many Thouſand Obſervations, and theſe compared with the beſt Sea Charts extant, yet in the Nature of Things it neither now is, nor ever can be abſolutely correct. For, let two Obſervers be on board the ſame Ship with different Inſtruments, they will frequently not agree in their Obſervations; add to this, that many Obſervers make no Allowance for the Dip, Refraction, and Difference of the Meridians, reſpecting the Sun's Declination.

Mr. Dalrymple obſerved to me, that although he had the inſpecting of the Journals of the Officers in the Eaſt India Company's Service, yet there were but few Places whoſe Longitude he could determine with any degree of Preciſion.

FINIS.

TABLE XII. The Refraction of the Heavenly Bodies in Altitude.

App Alt.	Ref.	App Alt.	Ref.	App Alt.	Ref
D. M	M. S.	D. M.	M.	D.	M. S.
0. 0	33. 0	6.30	7.51	30	1.38
0. 5	32.10	6.40	7.40	31	1.35
0.10	31.22	6.50	7.30	32	1.31
0.15	30.35	7 0	7.20	33	1.28
0.20	29.50	7 10	7.11	34	1.24
0.25	29. 6	7.20	7. 2	35	1.21
0.30	28.22	7.30	6.53	36	1.18
0.35	27.41	7.40	6.45	37	1.16
0 40	27. 0	7.50	6.37	38	1.13
0.45	26.20	8. 0	6.29	39	1.10
0.50	25.42	8.10	6.22	40	1. 8
0 55	25. 5	8.20	6.15	41	1. 5
1. 0	24.29	8.30	6. 8	42	1. 3
1. 5	23.54	8.40	6. 1	43	1. 1
1.10	23.20	8.50	5.55	44	0.59
1.15	22.47	9. 0	5.48	45	0.57
1.20	22.15	9.10	5.42	46	0.55
1.25	21.44	9.20	5.36	47	0.53
1.30	21.15	9.30	5.31	48	0.51
1.35	20.46	9.40	5.25	49	0.4
1.40	20.18	9.50	5.20	50	0.48
1.45	19.51	10. 0	5.15	51	0.46
1.50	19.25	10.15	5. 7	52	0.44
1.55	19. 0	10.30	5. 0	53	0.43
2. 0	18.35	10.45	4.53	54	0.41
2. 5	18.11	11. 0	4.47	55	0.40
2.10	17.48	11.15	4.40	56	0.38
2.15	17.26	11.30	4.34	57	0.37
2.20	17. 4	11.4	4.29	58	0.35
2.25	16.44	12. 0	4.23	59	0.34
2.30	16.24	12 20	4.16	60	0.33
2.35	16. 4	12.40	4. 9	61	0.32
2.40	15.45	13. 0	4. 3	62	0.30
2.45	15.27	13.20	3.57	63	0 29
2.50	15. 9	13.40	3.51	64	0.28
2.55	14.52	14. 0	3.45	65	0.26
3. 0	14.36	14.20	3.40	66	0.25
3. 5	14.20	14.40	3.35	67	0.24
3.10	14. 4	15. 0	3.30	68	0.23
3.15	13.49	15.30	3.24	69	0.22
3.20	13.34	16. 0	3.17	70	0.21
3.25	13.20	16.30	3.10	71	0.19
3.30	13 6	17. 0	3. 4	72	0 18
3 40	12.40	17.30	2.57	73	0.17
3.50	12.15	18. 0	2.54	74	0.16
4. 0	11.51	18.30	2.49	75	0.15
4.10	11.29	19. 0	2.44	76	0.14
4.20	11. 8	19.30	2.39	77	0.13
4.30	10.48	20. 0	2.35	78	0.12
4.40	10.29	20.30	2.31	79	0.11
4.50	10.11	21. 0	2.27	80	0.10
4. 0	9 54	21.30	2.24	81	0. 9
5.10	9.38	22. 0	2.20	82	0. 8
5.20	9.23	23. 0	2.14	83	0. 7
5.30	9. 8	24. 0	2. 7	84	0. 6
5.40	8.54	25. 0	2. 2	85	0. 5
6.50	8.41	26. 0	1.56	86	0. 4
8. 0	8.28	27. 0	1.51	87	0. 3
6.10	8.15	28. 0	1.47	88	0. 2
6.20	8. 3	29. 0	1.42	89	0. 1

TABLE XIII. Depression or Dip of the Horizon of the Sea.

Height of the Eye.	Dip of the Horizon
Feet.	M. S.
1	0.57
2	1.21
3	1.39
4	1.55
5	2. 8
6	2.20
7	2.31
8	2.42
9	2.52
10	3. 1
11	3.10
12	3.18
13	3.26
14	3.34
15	3.42
16	3.49
17	3.56
18	4. 3
19	4.10
20	4.16
21	4.22
22	4.28
23	4.34
24	4.40
26	4.52
28	5. 3
30	5.14
35	5.39
40	6. 2
45	6.24
50	6.44
60	7.23
70	7.59
80	8.32
90	9. 3
100	9.33

TABLE XIV. The Sun's Parallax in Altitude

Sun's Alt.	Sun's Parallax.
D.	S.
0	9
10	9
20	8
30	8
40	7
50	6
55	5
60	4
65	4
70	3
75	2
80	2
85	1
90	0

TABLE XV. Augmentation of the Moon's Semidiameter.

Moon's Alt.	Augmentation.
D.	S.
0	0
5	1
10	3
15	4
20	6
25	7
30	8
35	9
40	10
45	11
50	12
55	13
60	14
70	15
80&c.	16

TABLE XVI. Dip of the Sea at different Distances from the Observer

Dist. of the land in sea miles.	Height of the Eye above the Sea in Feet.							
	5	10	15	20	25	30	35	40
	Dip.	Dip.	Dip.	Dip.	Dip.	Dip	Dip.	Dip.
	M.	M	M.	M.	M.	M.	M.	M
$\frac{1}{4}$	11	22	34	45	56	68	79	90
$\frac{1}{2}$	6	11	17	22	28	34	39	45
$\frac{3}{4}$	4	8	12	15	19	23	27	30
1	4	6	9	12	15	17	20	23
$1\frac{1}{4}$	3	5	7	9	12	14	16	19
$1\frac{1}{2}$	3	4	6	8	10	12	14	15
2	2	3	5	6	8	10	11	12
$2\frac{1}{2}$	2	3	5	6	7	8	9	10
3	2	3	4	5	6	7	8	8
$3\frac{1}{2}$	2	3	4	5	6	6	7	7
4	2	3	4	4	5	6	7	7
5	2	3	4	4	5	5	6	6
6	2	3	4	4	5	5	6	6

A TABLE

OF THE

SUN's DECLINATION,

For the YEARS 1791, 1795, 1799, 1803.

1807 1811 1815 1819

Each being the third after Leap-Year.

Days.	Jan.	Feb.	March	April	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23. 0	17. 1	7.28	4.39	15. 9	22. 6	23. 7	18. 0	8.14	3.16	14.32	21.52
2	22.54	16.43	7. 5	5. 2	15.27	22.16	23. 3	17.45	7.52	3.40	14.51	22. 1
3	22.49	16.26	6.42	5.25	15.45	22.21	22.58	17.29	7.30	4. 3	15. 10	22.10
4	22.42	16.08	6.19	5.48	16. 2	22.28	22.53	17.13	7. 8	4.26	15.28	22.18
5	22.36	15.50	5.56	6.11	16.19	22.35	22.48	16.57	6.45	4.49	15.47	22.26
6	22.28	15.31	5.33	6.33	16.36	22.41	22.42	16.41	6.23	5.12	16. 5	22.33
7	22.21	15.13	5.10	6.56	16 53	22.47	22.36	16.24	6.	5.36	16.23	22.40
8	22.13	14.54	4.46	7.18	17. 9	22.53	22.29	16. 7	5.38	5.59	16.40	22.46
9	22. 4	14.34	4.23	7.40	17.25	22.58	22.22	15.50	5.15	6.21	16.57	22.52
10	21.55	14.15	3.59	8. 3	17.41	23. 3	22.15	15.32	4.52	6.44	17.14	22.58
11	21.46	13.55	3.36	8.25	17.57	23. 7	22. 7	15.14	4.30	7. 7	17.31	23. 3
12	21.36	13.35	3.12	8.47	18.12	23.11	21.58	14.56	4. 7	7.30	17.47	23. 8
13	21.26	13.15	2.49	9. 8	18.27	23.15	21.50	14.38	3.44	7.52	18. 4	23.12
14	21.16	12.55	2.25	9.30	18.41	23.18	21.41	14.20	3.21	8.15	18.19	23.15
15	21. 5	12.34	2. 1	9.51	18.56	23.20	21.32	14. 1	2.57	8.37	18.35	23.19
16	20.53	12.13	1.38	10.13	19.10	23.23	21.22	13.42	2.34	8.59	18.50	23.21
17	20.41	11.52	1.14	10.34	19.23	23.24	21.12	13.23	2.11	9.21	19 5	23.24
18	20.29	11.31	0.50	10.55	19.36	23.26	21. 1	13. 4	1.48	9.43	19.19	23.25
19	20.17	11.10	0.27	11.16	19.49	23.27	20.51	12.44	1.24	10.05	19.33	23.27
20	20. 4	10.48	0.03	11.36	20. 2	23.28	20.39	12.24	1. 1	10.26	19.47	23.27
21	19.50	10.27	0.21	11.57	20.14	23.28	20.28	12. 4	0.38	10.48	20.	23.28
22	19.37	10.05	0.45	12.17	20.26	23.28	20.16	11.44	0.14	11.09	20.13	23.28
23	19.23	9.43	1. 8	12.37	20.38	23.27	20. 4	11.24	0. 9S.	11.30	20.26	23.27
24	19 8	9.21	1.32	12.57	20.49	23.26	19.51	11. 3	0.33	11.51	20.38	23.26
25	18 53	8.58	1.55	13.16	21.	23.26	19.39	10.43	0 56	12.12	20.50	23.25
26	18.38	8.36	2 19	13.36	21.10	23.23	19.25	10.22	1.20	12.33	21. 1	23.23
27	18.23	8.14	2.42	13.55	21.21	23.21	19.12	10. 1	1.43	12.53	21.12	23.20
28	18.07	7.51	3. 6	14.14	21.30	23.18	18.58	9.40	2. 6	13.13	21.23	23.17
29	17.51		3.29	14.33	21.40	23.15	18.44	9.18	2.30	13.33	21.33	23.14
30	17.35		3.52	14.51	21.49	23.11	18.30	8.57	2.53	13.53	21.43	23.10
31	17.18		4.16		21.58		18.15	8.35		14.12		23. 6

A TABLE

OF THE

SUN's DECLINATION,

For the YEARS 1792, 1796, 1800, 1804.

1808-1812 1816 1820

Each being Leap-Year.

Days.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23. 1	17. 5	7.11	4.56	15.23	22.12	23. 4	17.48	7.57	3.34	14.46	21.59
2	22.56	16.48	6.48	5.19	15.40	22.19	23.	17.33	7.35	3.57	15. 5	22. 8
3	22.50	16.30	6.25	5.42	15.58	22.27	22.55	17.17	7.13	4.21	15.24	22.16
4	22.44	16.12	6. 2	6.05	16.15	22.34	22.49	17. 1	6.51	4.44	15.42	22.24
5	22.37	15.54	5.39	6.28	16.32	22.40	22.43	16.45	6.28	5. 7	16. 1	22.32
6	22.30	15.36	5.15	6.50	16.49	22.46	22.37	16.28	6. 6	5.30	16.18	22 39
7	22.23	15.17	4.52	7.13	17.05	22.52	22.31	16.11	5.43	5.53	16.36	22.45
8	22.15	14.58	4.29	7.35	17.22	22.57	22.24	15.54	5.21	6.16	16.53	22.51
9	22. 6	14.39	4. 5	7.57	17.37	23. 2	22.16	15.36	4.58	6.39	17.10	22.57
10	21.58	14.20	3.42	8.19	17.53	23. 6	22. 9	15.19	4.35	7. 2	17.27	23. 2
11	21.48	14. 0	3.18	8.41	18. 8	23.10	22. 0	15. 1	4.12	7.24	17.44	23. 7
12	21.39	13.40	2.54	9.03	18.23	23.14	21.52	14.43	3.49	7.47	18.	23.11
13	21.29	13.20	2.31	9.25	18.38	23.17	21.43	14.24	3.26	8. 9	18.15	23.15
14	21.18	13. 0	2.07	9.46	18.52	23.20	21.34	14. 6	3. 3	8.31	18.31	23.18
15	21. 7	12.39	1.43	10.08	19. 6	23.22	21.24	13.47	2.40	8.54	18.46	23.21
16	20.56	12.18	1.20	10.29	19.20	23.24	21.14	13.28	2.17	9.16	19. 1	23.23
17	20.44	11.58	0.56	10.50	19.33	23.26	21. 4	13. 8	1.53	9.38	19.16	23.25
18	0.32	11.36	0.32	11.11	19.46	23.27	20.53	12.48	1.30	9.59	19.30	23.26
19	20.20	11.15	0. 9	11.31	19.59	23.28	20.42	12.29	1. 7	10.21	19.43	23.27
20	20. 7	10.54	0.15N	11.52	20.11	23.28	20.31	12. 9	0.43	10.42	19.57	23.28
21	19.54	10.32	0.39	12.12	20.23	23.28	20.19	11.49	0.20	11. 4	20.10	23.28
22	19.40	10.10	1. 2	12.32	20.35	23.27	20. 7	11.29	0. 3S	11.25	20.23	23.27
23	19.26	9.48	1.26	12.52	20.46	23.26	19.55	11. 9	0.27	11.46	20.35	23.27
24	19.12	9.26	1.49	13.12	20.57	23.25	19.42	10.48	0.50	12. 7	20.47	23.25
25	18.57	9. 4	2.13	13.31	21.08	23.23	19.29	10.27	1.14	12.28	20.59	23.24
26	18.42	8.42	2.37	13.50	21.18	23.21	19.15	10. 6	1.37	12.48	21.10	23.21
27	18.27	8.19	3. 0	14. 9	21.28	23.18	19. 2	9.45	2. 1	13. 8	21.20	23.18
28	18.11	7.57	3.23	14.28	21.38	23.16	18.48	9.24	2.24	13.28	21.31	23.15
29	17.55	7.31	3.47	14.46	21.47	23.12	18.33	9. 2	3.47	13.48	21.41	23.11
30	17.39		4.10	15.0	21.55	23.08	18.19	8.41	3.11	14. 7	21.50	23. 7
31	17.22		4.33		22. 4		18. 4	8.16		14.25		23. 2

A TABLE

OF THE

SUN's DECLINATION,

For the YEAR 1797: 1801

1805 1809 1813 1817

Being the firſt after Leap-Year.

Days.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	22.57	16.52	1.17	4.51	15.18	22.10	23. 5	17.53	8. 3	3.28	14.41	21.57
2	22.52	16.35	0.54	5.14	15.36	22.17	23. 1	17.37	7.41	3.51	15.	22. 6
3	22.45	16.17	0.31	5.36	15.53	22.25	22.56	17.21	7.19	4.15	15.19	22.14
4	22.36	15.59	0. 8	5.59	16.11	22.32	22.50	17. 5	6.57	4.38	15.37	22.22
5	22.32	15.41	5.44	6.22	16.28	22.38	22.45	16.49	6.34	5. 1	15.56	22.30
6	22.25	15.22	5.21	6.45	16.44	22.44	22.38	16.33	6.12	5.24	16.14	22.37
7	22.17	15. 3	4.58	7. 7	17. 1	22.50	22.32	16.16	5.49	5.47	16.31	22.43
8	22. 9	14.44	4.35	7.30	17.17	22.55	22.26	15.59	5.27	6.10	16.49	22.49
9	22. 0	14.24	4.11	7.52	17.33	23.	22.18	15.41	5. 4	6.33	17. 6	22.55
10	21.51	14. 5	3.48	8.14	17.49	23. 5	22.11	15.24	4.41	6 55	17.23	23.
11	21.41	13.45	3.24	8.36	18. 4	23. 9	22. 3	15. 6	4.18	7.18	17.39	23. 5
12	21.31	13.25	3. 0	8.58	18.19	23.13	21.54	14.48	3.55	7.41	17.56	23.10
13	21.21	13. 5	2.37	9.19	18.34	23.16	21.45	14.29	3.32	8. 3	18.11	23.14
14	21.10	12.45	2.13	9.41	18.48	23.19	21.30	14.11	3. 9	8.25	18.27	23.17
15	20.58	12.24	1.49	10. 2	19. 2	23.21	21.27	13.52	2.46	8.48	18.42	23.20
16	20.47	12. 3	1.26	10.23	19.16	23.23	21.17	13.33	2.23	9.10	18.57	23.22
17	20.35	11.42	1. 2	10.44	19.30	23.25	21. 7	13.14	2.	9.32	19.12	23.24
18	20.23	11.21	0.39	11. 5	19.42	23.27	20.56	12.54	1.36	9.54	19.26	23.26
19	20.10	10.59	0.15	11.26	19.56	23.27	20.45	12.34	1.13	10.15	19.40	23 27
20	19.57	10 38	0. 9N	11.46	20. 8	23.28	20.34	12.15	0.49	10.37	19.54	23.28
21	19.44	10.16	0.32	12. 6	20.20	23.28	20.22	11.55	0.26	10.58	20. 6	23.28
22	19.30	9.54	0.56	12.27	20.32	23.27	20.10	11.34	0. 3	11.22	20.19	23.27
23	19.15	9.32	1.20	12.47	20.43	23.27	19.58	11.14	0.21S.	11.40	20 32	23.27
24	19. 1	9.10	1.44	13. 6	20.54	23.25	19.45	10.53	0.44	12. 1	20.44	23.26
25	18.46	8.48	2. 7	13.26	21. 5	23.24	19.32	10.32	1. 7	12.22	20.55	23.24
26	18.31	8.25	2.31	13.45	21.15	23.22	19.19	10.12	1.31	12.43	21. 7	23 22
27	18.15	8 2	2.54	14. 5	21.25	23.19	19. 5	9.50	1.54	13. 3	21.18	23.19
28	17.59	7.40	3.17	14.23	21.35	23.16	18.51	9.29	2.18	13.23	21.28	23.16
29	17.42		3 41	14.41	21.44	23.13	18.37	9. 8	2.41	13.43	21.38	23.12
30	17.26		4. 4	15.	21.53	23. 9	18.23	8.46	3. 4	14. 2	21.48	23. 8
31	17.10		4.27		22. 2		18. 8	8.25				23. 4

A TABLE

OF THE

SUN's DECLINATION

For the YEAR 1798: 1802 1806 1810 1814 1818

Being the second after Leap-Year.

Days.	Jan.	Feb.	March	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	22.58	16 57	7.23	4.44	15.14	22 8	23. 6	17.56	8. 8	3.22	14.37	21.55
2	22 53	16. 3	7.	5. 7	15.31	22.16	23. 2	17.41	7.46	3.46	14.56	22. 4
3	22.47	16.21	6.37	5.30	15.49	22.25	22.57	17.25	7.24	4. 9	15.14	22.12
4	22.41	16. 3	6.14	5.53	16.06	22.30	22.52	17. 9	7. 2	4.32	15.33	22.20
5	22.34	15.45	5.51	6.16	16.24	22.37	22.46	16.53	6.40	4.55	15.51	22.28
6	22.27	15.27	5.27	6.39	16.40	22.43	22.41	16.37	6.17	5 18	16. 9	22.35
7	22.19	15. 8	5. 4	7. 1	16.57	22.49	22.34	16.20	5.55	5.41	16 27	22.42
8	22.11	14.49	4.40	7.24	17.13	22.54	22.27	16 3	5.32	6. 4	16.45	22.48
9	22. 2	14.30	4.17	7.46	17.29	22.59	22.20	15.45	5. 9	6.27	17. 2	22.54
10	21.53	14.10	3.54	8. 8	17.45	23. 4	22.13	15.28	4.47	6.50	17.10	22.59
11	21 44	13.51	3 30	8.30	18. 1	23. 8	22. 5	15.10	4.24	7.13	17.35	23. 4
12	21.34	13.32	3. 6	8.52	18.16	23.12	21.57	14.52	4. 1	7.35	17.51	23. 8
13	21.24	13.10	2.43	9.14	18.30	23.15	21.48	14.34	3 38	7.58	18. 7	23.13
14	21.13	12.50	2.19	9.35	18.45	23.18	21.39	14 15	3.15	8.20	18.23	23.16
15	21. 2	12.29	1.55	9.57	18.58	23.21	21.29	13.56	2.52	8.43	18.38	23.19
16	20.50	12. 8	1 32	10.19	19.13	23.23	21.20	13 37	2.28	9. 4	18.53	23.22
17	20.38	11.47	1. 8	10.39	19.26	23.25	21. 9	13.18	2. 6	9 26	19. 8	23.24
18	20.26	11.26	0.44	11. 0	19.40	23.26	20.59	12.59	1.42	9.48	19.22	23 26
19	20.13	11. 5	0.21	11.21	19.52	23.27	20.48	12.39	1.18	10.10	19.36	23.27
20	20. 1	10.43	0. 3N	11.41	20.05	23.28	20.37	12.20	0.55	10.32	19.50	23.28
21	19.47	10.21	0.27	12. 2	20.17	23.28	20.25	12.	0.32	10.53	20. 5	23.28
22	19.33	10.	0.50	12.22	20.29	23.28	20.13	11.40	0. 9	11.15	20.16	23.28
23	19.19	9.37	1.14	12.42	20.41	23.27	20. 1	11.19	0.15 S	11.36	20.29	23.27
24	19. 5	9.16	1.37	13. 2	20.52	23.26	19.48	10.58	0.39	11.56	20.41	23 25
25	18.50	8 53	2. 1	13.21	21. 3	23.24	19.36	10.38	1. 2	12.17	20.53	23.24
26	18.35	8.31	2.25	13.40	21.13	23.22	19.22	10.17	1.25	12.38	21. 4	23.22
27	18.19	8. 8	2.48	13.59	21.23	23.20	19. 9	9.56	1.47	12 58	21.15	23.20
28	18. 3	7.45	3.11	14.18	21.33	23.17	18.55	9.34	2.12	13.18	21.26	23 17
29	17.47		3.35	14.37	21 42	23 14	18.41	9.13	2 36	13 38	21.36	23.13
30	17.30		3.58	14.55	21.51	23 10	18.26	8.52	2.59	13.58	21.45	23. 9
31	17.14		4.21		22.		18.11	8.30		14.17		23.5

A TABLE of the VARIATION of the SUN'S DECLINATION to every 10 Degrees of Longitude.

DEGREES of LONGITUDE from the MERIDIAN of LONDON.

Daily Var.	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
Min.	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
2	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
3	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
4	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2
5	0	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2
6	0	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3
7	0	0	0	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3
8	0	0	1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4
9	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
10	0	1	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5
11	0	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	5
12	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6
13	0	1	1	1	2	2	2	3	3	4	4	4	5	5	5	6	6	6
14	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	7	7
15	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7	7	7
16	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8
17	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	8
18	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	9	9
19	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	9	9
20	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10
21	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	10
22	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	10	11
23	1	1	2	3	3	4	4	5	6	6	7	8	8	9	10	10	11	11
24	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12

To find the SUN's DECLINATION by the foregoing TABLES.

EACH Page of the foregoing Tables contains the Sun's Declination for the Years that it is marked with at the top, and is divided into thirteen columns; the firſt of which to the Left Hand ſhews the Day of the Month, and the other Twelve the Months of the Year, ſo that if it be required to find the Sun's Declination for any Day; ſuppoſe, for example, on the 21ſt of Auguſt, 1796; Firſt, I look for that Table that has 1796 at the Top of it, and then right againſt the 21ſt Day of the Month, and under Auguſt, I find 11.49, which ſhews the Sun's Declination to be 11 degrees 49 minutes north; according to the Title at the Top of the Column.

The Sun's Declination in theſe Tables being calculated for the Meridian of London, if you ſhould be conſiderably to the Eaſtward or to the Weſtward of London, it will cauſe ſome alteration in it; to correct which, the

Table of the Variation of the Sun's Declination is to be uſed as follows:

Firſt, Look out the Declination for the given Day of the Month, and for the Day following it, and ſubtract the Leſſer from the Greater, the Remainder is the Daily Variation.

Second, Obſerve whether the Declination be increaſing or decreaſing, which you may know thus; If the Declination for the Day following the given Day be greateſt, then it is increaſing, but if it be leaſt, it is decreaſing.

Third, Look for the Daily Variation in the firſt Column of the Table, and ſee what Number ſtands right againſt it, add under the given Degrees of Longitude; which number is to be uſed as follows;

If the Difference of Longitude be Eaſterly, and the Declination increaſing, it muſt be ſubtracted from the Declination found in the Tables for the given Day; but if the Declination be decreaſing, it muſt be added.

If the Difference of Longitude be Weſterly, and the Declination increaſing, it muſt be added; but if the Declination be decreaſing, it muſt be ſubtracted; the Sum in one Caſe, and the Remainder in the other, will be the Sun's Declination at Noon in the Longitude required.

Suppoſe

Suppoſe on September 10, 1796, a Ship in Longitude 64 Degrees Weſt of London; what is the Sun's true Declination when on the Ship's Meridian?

	D. M.	
Decli. at London Sept. 10, 1796,	4 35 N.	And becauſe the Declin. is decreaſing, the Difference muſt be ſubtracted; therefore oppoſite to 23, and under 60 Degrees of Longitude ſtands 4 Minutes, which ſubtracted from 4° 35′, gives 4° 31′ the Declin. at the Ship.
Ditto at London Sept. 11,	4 12 N.	
Daily Variation of Declination	23 Miles.	

Again, ſuppoſe in Longitude 50 Degrees Eaſt, on March 20th, 1795, what is the Sun's Declination? Here the Daily Difference is 24.

	D. M.	
Sun's Decl. March 20	0 3 S.	Since the Declination is encreaſing, and the Longitude Eaſt, it muſt be ſubtracted, and the Remainder being nothing, ſhews that the Sun is upon the Equinoctial at the Ship's Meridian.
Variation for 50 Degrees	0 3 N.	
Declination at Noon at Ship	0 0	

In like Manner may the Declination be fitted to any Meridian; but it ſometimes happens that the Declination is wanted when the Sun is not upon the Meridian; in ſuch Caſes it is beſt to find the Declination for the preceding and following Noons, and take the Difference, and then ſay, as 24 Hours is to that Difference, ſo is the Hours from Noon to a Fourth Number, which being added or ſubtracted, according as the Declination is increaſing or decreaſing, and the Time being in the Fore or Afternoon, gives the Sun's Declination for the given Time.

Suppoſe it were required to find the Sun's Declination on April 15, 1791, at 8 Hours 55 Minutes in the Morning?

Firſt, I look in the Tables for the Sun's Declination, April 15, 1791, and find it to be 10° 8′; and then I look for it April 14, and find it to be 9° 46′; the Daily Difference is 22 minutes: Then I ſay, as 24 Hours is to 22 Minutes, ſo is 20H. 55M. the Time elapſed ſince laſt Noon, to 19 Minutes, which added to 9° 46′, becauſe the Declination is encreaſing, gives 10° 5′ for the Declination at the given Time; but had the Declination been decreaſing, the 19 Minutes muſt have been ſubtracted from the preceding Noon.

In like Manner the Declination is found for any Hour of the Day, and under any Meridian, for you have nothing more to do, but to reduce the Difference of Longitude into Time, and add to or ſubtract it from the given Time, according as the Longitude is Eaſt or Weſt, and then find the Declination as above.

When the Longitude and Time of the Day are given, turn the Longitude into Time, by allowing one Hour for every 15°, or 4 Minutes for every Degree, and add it to the given Time when the Longitude is Weſt, but ſubtract it when it is Eaſt, and the Sum or Difference will be the reduced Time at the Ship: Then ſay, as 24 Hours is to the Daily Difference of Declination, ſo is the Time at the Ship to a fourth Number, which muſt be either added to or ſubtracted from the Declination the preceding Noon, according as the Declination is increaſing or decreaſing.

The Declinations have been carefully compared with the Nautical Almanac, and computed to the neareſt Minute, which is of ſufficient exactneſs for determining the Latitude by Obſervation; but in finding the Time, in order to determine the Longitude, the Declination muſt be taken out of the Nautical Almanac, it being there calculated to Minutes and Seconds.

A TABLE

OF THE

SUN's RIGHT ASCENSION.

Days.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	South	South	South	North	North	North	North	North	North	South	South	South	
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M	H. M.	H. M.	H. M.	H. M.	
1	18 48	21 0	22 49	0 43	2 34	4 36	6 41	8 46	10 42	12 30	14 26	16 30	1
2	18 52	21 4	22 53	0 46	2 38	4 41	6 45	8 49	10 45	12 33	14 30	16 34	2
3	18 57	21 8	22 57	0 50	2 41	4 45	6 49	8 53	10 49	12 37	14 34	16 39	3
4	19 1	21 12	23 1	0 53	2 45	4 49	6 57	8 57	10 52	12 41	14 38	16 43	4
5	19 6	21 16	23 4	0 57	2 49	4 53	6 57	9 1	10 56	12 44	14 42	16 47	5
6	19 10	21 20	23 8	1 1	2 53	4 56	7 1	9 5	11 0	12 48	14 46	16 52	6
7	19 14	21 24	23 11	1 4	2 57	5 1	7 5	9 9	11 3	12 52	14 50	16 56	7
8	19 19	21 28	23 15	1 8	3 1	5 5	7 10	9 12	11 7	12 55	14 54	17 0	8
9	19 23	21 32	23 19	1 12	3 5	5 9	7 14	9 16	11 11	12 59	14 58	17 5	9
10	19 27	21 36	23 22	1 15	3 8	5 13	7 18	9 20	11 14	13 3	15 2	17 9	10
11	19 32	21 40	23 26	1 19	3 12	5 18	7 22	9 24	11 18	13 6	15 6	17 14	11
12	19 36	21 44	23 30	1 23	3 16	5 22	7 26	9 28	11 21	13 10	15 10	17 18	12
13	19 40	21 48	23 33	1 26	3 20	5 26	7 30	9 31	11 25	13 14	15 14	17 22	13
14	19 45	21 52	23 37	1 30	3 24	5 30	7 34	9 35	11 28	13 17	15 18	17 27	14
15	19 49	21 56	23 41	1 34	3 28	5 34	7 38	9 39	11 32	13 21	15 22	17 31	15
16	19 53	22 0	23 44	1 37	3 32	5 38	7 42	9 43	11 36	13 25	15 26	17 36	16
17	19 58	22 4	23 48	1 41	3 36	5 43	7 46	9 46	11 39	13 29	15 31	17 40	17
18	20 2	22 7	23 52	1 45	3 40	5 47	7 50	9 50	11 43	13 32	15 35	17 45	18
19	20 6	22 11	23 55	1 49	3 44	5 51	7 54	9 54	11 46	13 36	15 39	17 49	19
20	20 10	22 15	23 59	1 52	3 48	5 55	7 58	9 58	11 50	13 40	15 43	17 54	20
21	20 14	22 19	0 3	1 56	3 52	5 59	8 2	10 1	11 54	13 44	15 47	17 58	21
22	20 19	22 23	0 6	2 0	3 56	6 3	8 6	10 5	11 57	13 47	15 52	18 2	22
23	20 23	22 26	0 10	2 3	4 0	6 7	8 10	10 9	12 1	13 51	15 56	18 7	23
24	20 27	22 30	0 13	2 7	4 4	6 12	8 14	10 12	12 4	13 55	16 0	18 11	24
25	20 31	22 34	0 17	2 11	4 8	6 16	8 18	10 16	12 8	13 59	16 4	18 16	25
26	20 35	22 38	0 21	2 15	4 12	6 20	8 22	10 20	12 12	14 3	16 9	18 20	26
27	20 40	22 42	0 24	2 19	4 16	6 24	8 26	10 23	12 15	14 7	16 13	18 25	27
28	20 44	22 45	0 28	2 22	4 20	6 28	8 30	10 27	12 19	14 10	16 17	18 29	28
29	20 48		0 32	2 26	4 24	6 32	8 34	10 31	12 22	14 14	16 21	18 34	29
30	20 52		0 35	2 30	4 28	6 37	8 38	10 34	12 26	14 18	16 26	18 38	30
31	20 56		0 39		4 32		8 42	10 38		14 22		18 42	31

This table is sufficiently exact for finding when any ſtar comes to the meridian, in order to obtain the latitude; but in all calculations for determining the longitude by celeſtial obſervations, the ſun's right aſcenſion and declination muſt be taken out of the Nautical Almanac, as they are there calculated to a greater degree of accuracy.

A TABLE of the Right Aſcenſion and Declination of ſome of the principal fixed Stars, adapted to the Year 1796, with their Annual Variation.

Names of the Stars.	Sign	Right Aſcenſion. H.	M.	S.	Annu. Vari. S. T.	Declination. °	′	″		Annual Vari. S. T.
Shedar, in the breaſt of Caſſiopeia	3	0	28	51	+3.31	55	25	5	N	19 91+
Abruccabar, pole ſtar, tail of the Little Bear	2	0	56	24	10.05	88	13	13		19.69+
Mirach, in the girdle of Andromeda	2	0	58	22	3.30	34	32	7		19.45+
Almaach, in the foot of Andromeda	2	1	51	27	3.62	41	20	38		17.80+
Menkar, in the jaw of the Whale	2	2	51	38	3.13	3	16	52		14 80+
Algol, in the head of Meduſa	2	2	54	57	3.85	40	9	31		14.63+
Algenib, the bright ſtar in Perſeus	2	3	9	50	4.20	49	7	23		13.72+
Pleiades, the bright ſtar in Taurus	3	3	35	24	3.55	23	27	50		12.00+
Hyades, in Taurus	3	4	8	12	3.39	15	7	24		9.60+
Aldebaran, the Bull's ſouth eye	1	4	24	14	3.43	16	5	19		8.32+
Capella, in the Goat	1	5	1	40	4.40	45	46	12		5.30+
Bellatrix, in the weſt ſhoulder of Orion	2	5	14	12	3.22	6	9	8		4.15+
Betelgueſe, in the eaſt ſhoulder of Orion	1	5	44	8	3.25	7	21	21		1.58+
Caſtor, the bright ſtar in the head of Gemin	2	7	21	35	3.88	32	19	20		6.78—
Procyon, the bright ſtar in the Little Dog	1	7	28	39	3.20	5	44	58		7.40—
* Pollux, in the head of Gemini	2	7	31	52	3.75	28	30	26		7.70—
Acubens, in the claw of Cancer	3	8	47	16	3.24	12	38	18		13.35—
Regulus, in the Lion's heart	1	9	57	31	3.24	12	57	32		17.16—
Dubhe, upper Pointer in the Great Bear	2	10	51	2	3.88	62	51	0		19.09—
Alioth, the firſt in the tail of the Great Bear	2	12	45	6	2.69	57	4	10		19.69—
Benetnach, laſt in the tail of the Great Bear	2	13	39	31	2.41	50	20	11		18 24—
Arcturus, in Bootes	1	14	6	25	2.82	20	16	5		17 16—
Mirach, in the thigh of Bootes	3	14	46	10	2.63	27	56	27		15.67—
Alphacca, the bright ſtar in the Crown	2	15	26	4	2.54	27	24	39		12.60—
Raſ. Algethi, in the head of Hercules	2	17	25	27	2.74	14	38	1		4 87—
Raſ. Alhague, in the head of Ophiucus	2	17	5	22	2.75	12	43	18		3.15—
Raſtaben, in the head of the Dragon	2	17	51	52	1.37	51	30	59		0.78—
Vega, the bright ſtar in the Harp	1	18	30	1	2.62	38	35	54		2.52+
Atair, the bright ſtar in the Eagle	2	19	40	48	2.90	8	20	7		8.40+
Deneb, in the tail of the Swan	2	20	37	29	2.05	44	33	26		12.44+
Aldermain, in the ſhoulder of Cepheus	3	21	13	42	1.44	61	43	31		14.95+
Scheat, in the thigh of Pegaſus	2	22	53	54	2.88	26	58	8		19.18+
Marcab, in the wing of Pegaſus	2	22	54	37	2.98	14	6	37	S.	19 20+
Achernar, in the river Eridanus	1	1	30	7	2.25	58	16	39		18.56—
Rigel, in the foot of Orion	1	5	4	44	2.89	8	26	52		4.94—
Canopus, the bright ſtar in Argo	1	6	19	26	1.34	52	35	23		1.60+
Sirius, the bright ſtar in the Great Dog	1	6	36	11	2.69	16	25	58		3.10+
Alphard, in the heart of the female Hydra	2	9	17	34	2.96	7	46	53		15.13+
* Virgin's Spike, in the ſheaf of Virgo	1	13	14	28	3.15	10	5	28		13.00+
Zubeneſch, in the ſouth ſcale of Libra	2	14	39	38	3.31	15	11	3		15 50+
Zubenelg, in the north ſcale of Libra	2	15	6	3	3.22	8	37	13		13.93+
Antares, in the heart of Scorpio	1	16	16	56	3.66	25	57	55		8.70+
Fomalhaut, bright ſtar in the Southern Fiſh	1	22	46	20	3.33	30	41	52		18.97—
The foot of the Croſs	1	12	15	24	3.22	61	57	50		0.01+
The bright ſtar in the Oars	1	9	10	51	0.15	68	52	46		11.79+
The bright ſtar in Centaur	1	14	26	19	4.41	59	51	27		19.26+

If the places of theſe ſtars are wanted for any time before the beginning of the year 1796, multiply the annual variation, both in right aſcenſion and declination, by the number of years before 1796, and ſubtract the product from the right aſcenſion ſtanding in the table; but the product of the annual variation in declination muſt be added to, or ſubtracted from, the declination, according as the ſign + or — follow it; but for any years after 1796, the variation in right aſcenſion muſt be added to the right aſcenſion in the table, and the variation in declination muſt be either added to, or ſubtracted from it, according as their ſigns are, to fit the declination to any ſucceeding year.—The annual variation is ſet down for ſeconds, and decimals of a ſecond.

It is obvious, that by the ſun's annual motion, he is perpetually changing his declination and right aſcenſion, which is ſet down in the preceding table for the noon of every day at London; and may be reduced to any other time or meridian, as has been already ſhewn of the ſun.

By the preceſſion of the equinoxes, the fixed ſtars are continually altering their longitudes, right aſcenſions, and declinations; the alteration in the longitude is about 50 ſeconds every year; the alteration in right aſcenſion and declination of ſome of the principal fixed ſtars are ſet down in the preceding table for 1796; and their annual variation, which being applied to the right aſcenſion and declination in the table, by addition or ſubtraction, gives the right aſcenſion and declination for any ſucceeding years.

The right aſcenſion of the ſun, moon, or ſtars, is the number of degrees of the equinoctial that comes to the meridian with them, counted from the firſt point of Aries.

The uſe of the tables of the right aſcenſion of the ſun and ſtars is to find the time when any ſtar culminates, or is upon the meridian on a given day.

RULE.

Look for the right aſcenſion of the ſun and ſtar in the preceding tables, and ſubtract the ſun's right aſcenſion from the ſtar's; but if the ſun's right aſcenſion be greateſt, add 24 hours to the ſtar's right aſcenſion, and then ſubtract the ſun's from it, the remainder will be the time of the ſtar's coming to the meridian.

When the ſun's right aſcenſion is leaſt, the ſtar comes to the meridian in the afternoon, but before noon when the ſun is greateſt.

EXAMPLE I.

At what time will the ſtar Arcturus be on the meridian of London, Dec. 1?

	H.	M.
Arcturus's right aſcenſion -	14	6
	24	0
	38	6
Sun's right aſcenſion —	16	31
After midnight —	21	35
	12	0
Morning — —	9	34

That is, the ſtar Arcturus will be upon the meridian of London 35 minutes after nine o'clock in the morning.

EXAMPLE II.

At what time will the ſtar Virgin's Spike be on the meridian of London, September 1?

	H.	M.
Spica Virginis's right aſcenſion	13	14
Sun's right aſcenſion —	10	42
The ſtar culminates afternoon	2	32

So that the ſtar Virgin's Spike comes to the meridian at London 32 minutes after two in the afternoon.

To find what Star will come upon the Meridian at any given Time.

RULE.

Add the time from noon to the right aſcenſion of the ſun, the ſum will be the right aſcenſion of the ſtar required to be known; with which enter the table of the ſtar's right aſcenſion, and find what ſtar's right aſcenſion agrees with, or comes the neareſt to it, and that is the ſtar required.

EXAMPLE I.

I would know what ſtar would be on the meridian of London about ten at night, January 25?

	H.	M.
Sun's right aſcenſion January 25, at noon —	20	31
And for 10 hours more —	0	2
Given time 10 hours P. M.	10	0
	30	33
Sub.	24	0
Nearly anſwers neareſt to Sirius	6	33

EXAMPLE II.

What ſtar will be upon the meridian of London 20 minutes paſt four in the morning, May 10?

	H.	M.
Sun's right aſcenſion May 9 at noon	3	5
And for 16 hours more —	0	3
Given time 16 hours, 30 minutes P.M. — —	16	30
Right aſcenſion of mid. heaven	19	38

Anſwers nearly to Atair in the Eagle.

DECLINATION IN DEGREES.

Lat.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23.29	Lat.
	D. M.	D.M.	D.M.	D. M.	D.M.	D. M.	D.M.	D. M.	D M	D.M.	D.M.	D.M.	D.M.	D.M.	D.M	D M	D.M.	D. M.	D.M.	D.M.	D .	D.M.	D.M.	D.M.	
1	1. 0	2. 0	3. 0	4. 0	5. 0	6. 0	7. 0	8. 0	9. 0	10 0	11. 0	12. 0	13. 0	14. 0	15. 0	16. 0	17. 0	18. 0	19. 0	20. 0	21. 0	22. 0	23. 0	23.29	1
2	1. 0	2. 0	3. 0	4. 0	5. 0	6. 0	7. 0	8. 0	9. 0	10. 0	11. 0	12. 0	13. 0	14 0	15. 0	16. 1	17. 1	18. 1	19. 1	20. 1	21. 1	22. 1	23. 1	23. 0	2
3	1. 0	2. 0	3. 0	4. 0	5. 0	6. 0	7. 1	8. 1	9.	10. 1	11. 1	12. 1	13. 1	14. 1	15. 1	16. 1	17. 1	18. 1	19. 1	20. 2	21. 2	22. 2	23. 2	23. 31	3
4	1. 0	2 0	3. 0	4. 0	5. 0	6. 1	7. 1	8. 1	9. 1	10. 1	11. 2	12. 1	13. 2	14. 2	15. 2	16 2	17. 2	18. 2	19. 3	20. 3	21. 3	22. 3	23. 3	23. 33	4
5	1. 0	2. 0	3. 0	4. 1	5. 1	6. 1	7. 2	8. 2	9. 2	10. 2	11. 3	12. 3	13. 3	14. 3	15. 4	16. 4	17. 4	18. 4	19. 4	20. 5	21. 5	22. 5	23. 5	23. 35	5
6	1. 0	2. 0	3. 1	4. 1	5. 1	6. 2	7. 2	8. 2	9. 3	10 2	11. 3	12. 4	13. 4	14. 4	15. 5	16. 5	17. 5	18 6	19. 6	20. 7	21. 7	22. 7	23. 8	23. 38	6
7	1. 0	2. 1	3. 1	4. 2	5. 2	6. 2	7. 3	8. 3	9. 4	10. 4	11 5	12 5	13 6	14. 6	15. 7	16 8	17. 8	18. 8	19. 9	20. 9	21. 10	22. 10	23. 11	23 40	7
8	1. 0	2. 1	3. 1	4. 2	5. 3	6. 3	7. 4	8. 4	9. 5	10. 5	11. 6	12.	13. 8	14. 8	15. 10	16. 10	17 10	18. 11	19. 11	20 12	21. 13	22. 13	23. 14	23. 44	8
9	1. 0	2. 1	3. 2	4. 3	5. 3	6. 4	7. 5	8 6	9 7	10. 7	11. 8	12. 9	13. 10	14. 10	15. 11	16. 12	17. 13	18. 14	19. 15	20 16	21. 17	22. 17	2. 18	23. 49	9
10	1. 1	2. 2	3. 3	4. 4	5. 4	6. 5	7. 6	8. 7	9. 8	10 10	11. 11	12. 12	13. 13	14. 14	15 15	16 16	17. 17	18 18	19 19	20. 20	21 21	22. 22	23. 23	23. 54	10
11	1. 1	2. 2	3. 3	4. 4	5. 5	6. 6	7. 7	8. 8	9. 10	10 11	11. 11	12. 13	13. 13	14 16	15. 17	16 18	17. 20	18. 21	19 22	20. 24	21 2	22 26	23. 28	23. 58	11
12	1. 1	2. 3	3. 4	4. 5	5. 7	6. 8	7. 9	8. 11	9. 12	10 13	11. 14	12. 16	13. 18	14. 19	15. 21	16. 22	17. 23	18. 25	19 26	20. 28	21.	22 31	23 33	24. 3	12
13	1. 2	2. 3	3 5	4. 6	5. 8	6. 10	7. 11	8. 12	9. 13	10. 15	11. 17	12. 19	13. 21	14. 22	15. 24	16 26	7 28	18. 30	19. 31	20 33	21 35	22 37	23. 38	24. 8	13
14	1. 2	2. 3	3. 5	4. 7	5. 9	6. 11	7. 13	8. 15	9. 17	10 18	11. 20	12. 22	13. 24	14 26	1 28	16 30	17 2	18 34	19 36	20. 38	21 41	22. 43	23. 45	24. 1	14
15	1 2	2 4	3. 6	4. 8	5 11	6 13	7. 15	8. 17	9. 1	10 21	11 23	12 25	13 28	14. 30	15. 33	16. 35	17. 37	18 40	19 42	20 44	21. 46	22 49	23. 51	24. 2.	15
16	1. 2	2. 4	3. 7	4. 10	5. 12	6. 15	7. 17	8 19	9. 22	10. 24	11. 27	12 29	13. 32	14. 34	15. 37	16. 40	17 42	18. 45	19. 48	20. 51	21. 53	22. 56	23 59	24. 29	16
17	1. 2	2 5	3. 8	4. 11	5 13	6 16	7. 19	8. 22	9 25	10 28	11. 30	12 33	13. 36	14. 39	15 42	16. 45	17. 4	18. 51	19. 54	20 57	22. 0	23 4	24. 7	24 38	17
18	1. 3	2 6	3. 9	4. 12	5. 15	6. 19	7. 22	8 25	9. 28	10. 30	11 34	12 38	13 41	14. 44	15 46	16 51	17 5	18. 57	20 1	21.	22 8	23 12	24 15	24. 46	18
19	1.	2	3 10	4. 13	17	6. 21	7. 24	8. 28	9. 3	10 4	11. 8	12 42	13. 47	14. 50	15. 53	16 57	18 1	19. 5	20. 8	21. 12	22 16	23 20	24. 24	24. 56	19
20	1.	2. 8	3. 12	4. 15	5 19	6. 23	7. 27	8. 31	9. 35	10. 38	11. 43	12. 47	13 51	14. 56	16. 0	17 4	18. 8	19 12	20. 16	21. 20	22. 25	23 29	24. 34	25. 5	20
21	1. 4	2 8	3 13	4. 17	21	6. 26	7 30	8. 34	9. 39	10 43	11. 48	12 52	13 57	15. 1	16. 5	17 10	18. 15	19 20	20 24	21. 29	22. 34	23 39	24. 44	25. 16	21
22	1. 4	2. 9	3 14	4. 1	23	6. 28	7 33	8. 38	9. 43	10. 47	11. 53	12. 58	14. 3	15. 8	16. 13	17. 18	18. 23	19. 28	20. 33	21. 39	22. 44	23. 50	24. 55	25. 27	22
23	1. 5	2. 10	3 15	4. 21	26	6. 31	7. 36	8. 42	9. 4	10. 52	11. 58	13. 3	14. 9	15. 14	16. 19	17. 25	18. 31	19. 37	20 43	21 49	22. 55	24. 1	25. 7	25. 39	23
24	1. 5	2. 11	3. 17	4. 23	5. 28	6. 34	7. 40	8. 45	9. 51	10 57	12. 3	13. 9	14. 17	15. 21	16. 27	17. 34	18 40	19. 46	20. 52	21 58	23 6	24. 12	25. 19	25. 51	24
25	1. 6	2. 12	3 18	4. 25	5 31	6. 37	7. 43	8. 50	9. 56	11. 2	12. 9	13 16	14. 23	15 2	16. 35	17. 42	18. 49	19 56	21. 3	22 10	23. 17	24. 24	25. 32	26. 4	25
26	1. 7	2. 13	3 20	4. 27	5. 33	6. 41	7. 58	8. 54	10. 1	11. 8	12. 15	13. 23	14. 30	15. 37	16 44	17. 51	18 59	20. 6	21. 14	22. 22	23 30	24 38	25. 46	26 19	26
27	1 7	2. 14	3. 22	4 29	36	6 4	7. 51	8. 59	10. 6	11. 14	12. 22	13. 30	14. 38	15. 45	16 53	18 1	19. 9	20. 17	21. 25	22. 33	23. 43	24. 51	26. 0	26. 34	27
28	1. 8	2 16	3. 24	4. 32	5. 40	6. 48	7. 56	9. 4	10. 12	11. 20	12 29	13 37	14. 46	15. 5	17 3	18. 11	19 20	20. 29	21. 38	22. 48	23. 57	25 6	26 16	6. 49	28
29	1. 8	2. 17	3 25	4. 34	5. 43	6. 52	8. 0	9. 9	10 18	11. 27	12. 36	13. 45	14 54	16 3	17 12	18 22	19. 31	20. 41	21 51	23. 1	24 11	25. 22	26. 32	27. 6	29
30	1. 9	2. 18	3. 28	4 37	5. 46	6 56	8 5	9. 15	10. 24	11 33	12. 42	13. 53	15 3	16. 13	17. 23	18 33	19. 43	20 54	22. 5	23. 16	24. 27	5 38	26. 49	7. 23	30
31	1. 10	2. 20	3. 30	4 40	5. 50	7. 0	8. 10	9. 21	10. 31	11. 41	12. 52	14 2	15. 13	16. 23	17. 34	18. 45	19. 56	21. 8	22. 19	23. 31	24 4	2. 56	7 7	7 42	31
32	1. 10	2. 21	3. 32	4. 43	5. 54	7. 5	8. 16	9. 27	10. 38	11 49	13. 0	14. 11	15. 23	16. 34	17. 46	18. 58	20. 10	21 22	22 34	23 47	25. 0	26. 13	7. 20	28. 1	32
33	1. 11	2. 23	3. 35	4 46	5. 58	7. 9	8. 20	9. 33	10. 45	11. 57	13. 9	14. 21	15. 33	16. 45	17. 58	19. 11	20. 24	21. 37	22. 50	24 4	25. 18	26. 2	7. 46	8 23	33

DECLINATION IN DEGREES.

Lat.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23.29	Lat.
	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	D.M.	
34	1.12	2.25	3.37	4.50	6. 2	7.15	8.27	9.39	10.52	12. 5	13.18	14.32	15.44	16.57	18.1	19.25	20.39	21.53	23. 7	24.21	25.36	26.51	28. 7	28.44	34
35	1.13	2.27	3.40	4.53	6. 6	7.20	8.33	9.47	11. 0	12.14	13.28	14.42	15 55	17.11	18.25	19.40	20.55	22.10	23.25	24.40	25.56	27.13	28.29	29. 7	35
36	1.14	2.28	3.43	4.57	6.11	7.25	8.39	9.54	11. 8	12.23	13.38	14.53	16. 9	17.24	18.39	19.55	21.11	22.27	23.43	25. 0	26.18	27.35	28.53	29.30	36
37	1.15	2.30	3.45	5. 0	6.15	7 31	8.46	10. 2	11.17	12.33	13.49	15. 5	16.21	17.38	18.54	20.11	21.28	22.46	24. 3	25.21	26.39	27.58	29.17	29.56	37
38	1.16	2.32	3.4	5. 5	6.21	7.37	8.54	10.11	11.27	12.44	14. 1	15.18	16.35	17.53	19.10	20.28	21.46	23. 5	24.24	25.43	27. 3	28.23	29.43	30.23	38
39	1.17	2.34	3.51	5. 8	6.24	7.43	9. 1	10.19	11.37	12.54	14.12	15.31	16.49	18. 8	19.27	20.46	22. 6	23.26	24.46	26. 6	27.27	28.49	30.11	30.51	39
40	1.18	2.36	3.55	5.13	6.32	7.50	9. 9	10.28	11.47	13. 6	14.25	15.45	17. 5	18.26	19.46	21. 5	22.26	23.47	25. 9	26.31	27.53	29.16	30.40	31.22	40
41	1.19	2.39	3.58	5.18	6.38	7.57	9.17	10.37	11.57	13.18	14.39	16. 0	17.21	18.42	20. 4	21.26	22.48	24.10	25.33	26. 6	28.21	29.46	31.11	31 53	41
42	1.21	2.41	4. 2	5.23	6.44	8. 5	9.26	10.47	12. 8	13.31	14.53	16.15	17.37	18. 0	20.23	21.46	23.10	24.34	25.58	27 24	28.50	30.16	31.43	32.26	42
43	1.22	2.44	4. 6	5.28	6.51	8.13	9.35	10.58	12.21	13.44	15. 7	16.31	17.55	19.19	20.43	22. 8	23.34	24.59	26.25	27 53	29.2	30.48	32.16	33. 0	43
44	1.23	2.47	4.10	5.34	6.58	8.21	9.45	11. 9	12.34	13.58	15.23	16.48	18.13	19.39	21. 5	22.32	23.59	25.26	26.54	28.23	29.53	31.22	32.51	33.37	44
45	1.25	2.50	4.15	5.40	7. 5	8.30	9.50	11.21	12.47	14.13	15.38	17. 6	18.33	20. 0	21.28	22.56	24.25	25.54	27.25	28.56	30.27	31.58	33.30	34.16	45
46	1.26	2.53	4.19	5.46	7.12	8.39	10. 6	11.34	13. 1	14.28	15.56	17.25	18.54	20.23	21.52	23.23	24.53	26.25	27.58	29.31	31. 3	32.37	34.12	35. 0	46
47	1.28	2.56	4.24	5.52	7.20	8.49	10.18	11.47	13.16	14.44	16.13	17.45	19.16	20.47	22.18	23.50	5.23	26.57	28.32	30. 7	31.42	33.18	34.56	35.46	47
48	1.20	2.59	4 29	5.57	7.29	8.59	10.30	12. 0	13.31	15. 2	16.34	18. 6	19.39	21.12	22.45	24.40	25.55	27.31	29. 7	30.45	32.23	4. 3	35.43	36.3	48
49	1.31	3. 3	4.34	6. 6	7.38	9.10	10.42	12.14	13.4	15.21	16.53	18.28	20. 3	21.38	23.14	24.51	26.28	28. 6	29.45	31.25	3. 6	4.48	6 33	37.26	49
50	1.33	3. 6	4.40	6.14	7.48	9.21	10.55	12.29	14. 5	15.40	17.16	18.52	20.29	22. 6	23.43	25.24	27. 3	28.43	30.25	32. 8	33.52	5.37	37.26	38.20	50
51	1.35	3.10	4.46	6.22	7.58	9.33	11. 9	12.46	14.24	16. 1	17.39	19.18	20.57	22.37	24.18	25.59	27.41	29.24	1. 8	32.54	34.41	36.30	38.23	39.19	51
52	1.37	3.15	4.52	6.30	8. 8	9.46	11.24	13. 3	14.43	16.23	18. 6	19.44	21.29	23. 8	24.52	26.36	28.21	30. 7	31.55	33.44	35.34	37 27	39.24	40.23	52
53	1.40	3.20	4.59	6.39	8.19	10. 0	11.40	13.21	15. 3	16.46	18.29	20.12	21.57	23 42	25.28	27.16	29. 4	30 53	32.45	4.38	36.33	38.29	40.29	41.29	53
54	1.42	3.24	5. 5	6.49	8.31	10.15	11 57	13.41	15.26	17.11	18.57	20.4	22.30	24.18	26. 7	27.58	29.50	31 42	33 38	35.35	37.32	39.16	51.43	42.4	54
55	1.45	3.29	5.14	6.59	8.44	10.30	12.15	14. 2	15.48	17.57	19.20	21.14	23. 5	24.56	26.49	28.43	0.39	3. 35	4 35	36.36	38.39	40.47	42.56	44. 0	55
56	1.47	3.34	5.22	7.10	8.57	10.47	13.35	14.24	16.13	18. 5	19.56	21.49	23.43	25. 37	27.34	29.32	1.31	33.33	5.36	37.42	39.51	42. 4	44.19	45.27	56
57	1.50	3.40	5.31	7.22	9 11	11. 4	12.56	14.48	16 45	18.33	20.29	22.25	24.23	26.21	28.22	30.24	32.27	34.34	6.46	38.53	41. 9	43 27	45.50	47. 2	57
58	1.53	3.46	5.40	7.34	9.26	11.22	13.18	15.14	17.10	19. 7	21. 4	23. 4	25. 0	27. 9	29.14	31 21	33.28	35.40	37.54	40.12	42.34	44. 59	47.30	48.46	58
59	1.56	3.53	5.50	7.47	9.43	11.42	13.41	15.41	17.44	9.41	21.43	23.47	25.54	28. 1	30.12	32.22	34.14	36.53	39.13	41.37	44. 5	46.40	49.21	50.51	59
60	2. 0	4. 0	6. 0	8. 1	10. 2	12. 4	14. 6	16.10	18.14	20.18	22.23	24.34	26.46	28.55	31. 0	33 27	5.45	38. 9	10.36	43.10	45.48	48.31	51.24	52.51	60
61	2. 3	4. 8	6.12	8.17	10.21	12.27	14.34	16.40	18.46	20.57	23.1	25.23	27.39	29.56	32.16	34.3	7. 5	39.36	42.11	44.52	47.40	0.35	3.42	55.17	61
62	2. 7	4.15	6.24	8.32	10.41	12.52	15. 2	17.14	19.28	21.42	23.59	26.17	28.37	31. 1	33.27	35.57	38.31	41.10	43.54	46.46	49.46	52.56	56.20	58. 4	62
63	2.12	4.24	6.37	8.50	11. 4	13.19	15.34	17.51	20. 9	22.27	24.51	27.18	29.42	32.12	34 45	37.23	40. 5	42 54	45.49	48.53	52. 7	55.36	59.24	61.22	63
64	2 17	4.33	6.51	9. 9	11.28	13.47	16. 8	18.30	20.54	23.18	25.38	28.16	30.52	33.30	36.11	38.55	1.49	44.49	47.57	51.17	54.50	58.43	63. 2	65.22	64
65	2.22	4.44	7. 0	9.30	11.54	14.19	16.45	19.13	21.43	24.13	26.50	29.28	32. 9	34.55	37.46	40.42	43.46	46.59	50.43	54. 2	7.55	62.26	67.26	70.33	65
66	2.27	4.55	7.23	9.25	12.21	14.53	17.20	20. 0	22.37	25.14	27.58	30.44	33.34	36.29	39.31	42.40	45.58	49.26	53.11	57.14	61.47	67. 4	73.52	78.23	66

A TABLE shewing the Time of the Sun, Moon, and Stars' Setting, when they have North Declination, or the Time of their Rising, when they have South Declination.

DEGREES OF DECLINATION.

Lat.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23 29	Lat.
	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	
1	6.00	6.00	6.0	6.00	6.00	6.00	6.00	6.00	6.00	6.01	6.01	6.01	6.01	6.01	6.01	6.01	6.01	6.01	6.01	6.01	6.01	6.02	6.02	6.02	6 02	1
2	6.00	6.00	6.0	6.00	6.00	6.00	6.01	6.01	6.01	6.01	6.01	6.01	6.02	6.02	6.02	6.02	6.02	6.02	6.03	6.03	6.03	6.03	6.03	6.04	6.04	2
3	6.00	6.00	6.0	6.0	6.01	6.01	6.01	6.01	6.02	6.02	6.02	6.02	6.02	6.03	6.03	6.03	6.03	6.04	6.04	6.05	6.04	6.05	6.05	6.05	6.05	3
4	6.00	6.00	6.0	6.01	6.01	6.01	6.02	6.02	6.02	6.03	6.03	6.03	6.03	6.04	6.04	6.04	6.05	6.05	6.05	6.05	6.06	6.06	6.06	6.07	6.07	4
5	6.00	6.00	6.01	6.01	6.01	6.02	6.02	6.02	6.03	6.03	6.04	6.04	6.04	6.05	6.05	6.05	6.06	6.06	6.07	6.07	6.07	6.08	6.08	6.09	6.09	5
6	6.00	6.00	6.01	6.01	6.02	6.02	6.03	6.03	6.03	6.04	6.04	6.05	6.05	6.06	6.06	6.06	6.07	6.07	6.08	6.08	6.09	6.09	6.10	6.10	6.11	6
7	6.00	6.00	6.01	6.01	6.02	6.02	6.03	6.03	6.04	6.04	6.05	6.06	6.06	6.06	6.07	6.08	6.08	6.09	6.09	6.10	6.10	6.11	6.11	6.12	6.12	7
8	6.00	6.00	6.01	6.02	6.02	6.03	6.03	6.04	6.04	6.05	6.06	6.07	6.07	6.07	6.08	6.09	6.09	6.10	6.10	6.11	6.12	6.12	6.13	6.14	6.14	8
9	6.00	6.1	6.01	6.02	6.02	6.03	6.04	6.04	6.05	6.06	6.06	6.08	6.08	6.08	6.09	6.10	6.10	6.11	6.12	6.13	6.14	6.14	6.15	6.15	6.16	9
10	6.00	6.1	6.01	6.02	6.03	6.04	6.04	6.05	6.06	6.06	6.07	6.08	6.09	6.09	6.10	6.11	6.12	6.12	6.13	6.14	6.15	6.16	6.16	6.17	6.17	10
11	6.00	6.1	6.02	6.02	6.03	6.04	6.05	6.05	6.06	6.07	6.08	6.09	6.09	6.10	6.11	6.12	6.13	6.14	6.14	6.15	6.16	6.17	6.18	6.19	6.19	11
12	6.0	6.1	6.02	6 03	6.04	6.04	6.05	6 06	6.07	6.08	6.09	6.09	6.10	6.11	6.12	6.13	6.14	6.15	6.16	6.17	6.18	6.19	6.20	6.21	6.21	12
13	6.00	6.1	6.02	6.03	6.04	6.05	6.06	6.06	6.07	6.08	6.09	6.10	6.11	6.12	6.13	6.14	6.15	6.16	6.17	6.18	6.19	6.20	6.21	6.22	6.23	13
14	6.00	6.1	6.02	6 03	6.04	6.05	6.06	6.07	6.08	6.09	6.10	6.11	6.12	6.13	6.14	6.15	6.16	6.17	6.19	6.20	6.21	6.22	6.23	6.24	6.25	14
15	6.00	6.1	6.02	6.03	6.04	6.05	6.06	6.07	6.09	6.10	6.11	6 12	6.13	6.14	6.15	6.16	6.18	6.19	6.20	6.21	6.23	6.23	6.25	6 26	6.27	15
16	6.00	6.1	6.02	6 03	6.05	6.06	6.07	6.08	6.09	6.10	6.12	6.13	6.14	6.15	6.16	6.18	6.19	6.20	6.21	6.2	6.24	6.25	6.27	6.28	6.29	16
17	6.00	6.1	6.02	6.04	6.05	6.06	6.07	6.09	6.10	6.12	6.12	6.13	6.15	6.16	6.17	6.19	6.20	6.21	6.23	6.24	6.25	6.27	6.28	6.30	6.31	17
18	6.00	6.1	6.02	6.04	6.05	6.06	6.08	6.09	6.10	6.13	6.13	6.14	6.16	6.17	6.19	6.20	6.21	6.22	6.24	6.26	6.27	6.29	6.30	6.32	6.33	18
19	6.00	6.1	6.03	6.04	6.05	6.07	6.08	6.10	6.11	6.13	6.14	6.15	6.17	6.18	6.20	6.21	6.23	6.24	6.26	6.27	6.28	6.30	6.31	6.33	6.34	19
20	6.00	6.1	6.03	6.04	6.06	6.07	6.09	6.10	6.12	6.14	6.15	6.16	6.18	6.19	6.21	6.22	6.24	6.25	6.27	6.29	6.30	6.32	6.33	6.35	6.36	20
21	6.00	6.1	6.03	6.05	6.06	6.08	6.09	6.11	6.12	6.14	6.16	6.17	6.19	6.20	6.22	6.24	6.25	6.27	6.29	6.30	6.32	6.34	6.35	6.37	6.38	21
22	6.00	6.2	6.03	6.05	6.06	6.08	6.10	6.11	6.13	6.15	6.16	6.18	6.20	6.21	6.23	6.25	6.27	6.28	6.30	6.32	6.34	6.36	6.37	6.39	6.40	22
23	6.00	6.2	6.03	6.05	6.07	6.09	6.10	6.12	6.14	6.15	6.17	6.19	6.21	6.23	6.24	6.26	6.28	6.30	6.32	6.34	6.36	6.37	6.39	6.41	6.42	23
24	6.00	6.2	6.03	6 05	6.07	6.09	6.11	6.13	6.14	6.16	6.18	6.20	6.22	6.24	6.25	6.27	6.29	6.31	6.33	6.35	6.37	6.39	6.41	6.43	6.44	24
25	6.00	6.2	6.04	6.06	6.07	6.09	6.11	6.13	6.15	6.17	6.19	6.21	6.23	6.25	6.27	6.29	6.31	6.33	6.35	6.37	6.39	6.41	6.43	6.46	6.47	25
26	6.00	6.2	6.04	6.06	6.08	6.10	6.12	6.14	6.16	6.18	6.20	6.22	6.24	6.26	6.28	6.30	6.32	6.34	6.36	6.39	6.41	6.43	6.45	6.48	6.49	26
27	6.00	6.2	6.04	6 06	6.08	6.10	6.12	6.14	6.16	6.19	6.21	6.23	6.25	6.27	6.29	6.31	6.34	6.36	6.38	6.40	6.43	6.45	6.48	6.50	6.51	27
28	6.00	6.2	6.04	6.06	6.09	6.11	6.13	6.15	6.17	6.19	6.22	6.24	6.26	6.28	6.30	6.33	6.35	6.37	6.40	6.42	6.45	6.47	6.50	6.52	6.53	28
29	6.00	6.2	6.04	6.07	6.09	6.11	6.13	6.16	6.18	6.20	6.23	6.25	6.27	6.29	6.32	6.34	6.37	6.39	6.42	6.44	6.47	6.49	6.52	6.54	6.55	29
30	6.00	6.2	6.05	6.07	6.09	6.12	6.14	6.16	6.19	6.21	6.23	6.26	6.28	6.31	6.33	6.36	6.38	6.41	6.43	6.46	6.48	6.51	6.54	6.57	6.58	30

A TABLE shewing the Time of the Sun, Moon, and Star's Setting, when they have North Declination, or the Time of their Rising, when they have South Declination.

DEGREES OF DECLINATION.

Lat.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23 29	Lat.
	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	
31	6.00	6.02	6.05	6.07	6.10	6.12	6.15	6.17	6.19	6.22	6.24	6.27	6.29	6.32	6.34	6.37	6.40	6.42	6.45	6.48	6.51	6.53	6.56	6.59	7.01	31°
32	6.00	6.02	6.05	6.08	6.10	6.13	6.15	6.18	6.20	6.23	6.25	6.28	6.31	6.33	6.36	6.39	6.41	6.44	6.47	6.50	6.53	6.56	6.58	7.01	7.03	32
33	6.00	6.03	6.05	6.08	6.10	6.13	6.16	6.18	6.21	6.24	6.26	6.29	6.32	6.34	6.37	6.40	6.43	6.46	6.49	6.52	6.55	6.58	7.01	7.04	7.06	33
34	6.00	6.03	6.05	6.08	6.11	6.14	6.16	6.19	6.22	6.25	6.27	6.30	6.33	6.36	6.39	6.42	6.45	6.48	6.51	6.54	6.57	7.00	7.03	7.06	7.08	34
35	6.00	6.03	6.06	6.08	6.11	6.14	6.17	6.20	6.23	6.25	6.28	6.31	6.34	6.37	6.40	6.43	6.46	6.49	6.53	6.56	6.59	7.02	7.06	7.09	7.11	35
36	6.00	6.03	6.06	6.09	6.12	6.15	6.18	6.20	6.23	6.26	6.29	6.32	6.36	6.39	6.42	6.45	6.48	6.52	6.55	6.58	7.01	7.05	7.08	7.12	7.14	36
37	6.00	6.03	6.06	6.09	6.12	6.15	6.18	6.21	6.24	6.27	6.31	6.34	6.37	6.40	6.43	6.47	6.50	6.53	6.57	7.00	7.04	7.07	7.11	7.15	7.17	37
38	6.00	6.03	6.06	6.09	6.13	6.16	6.19	6.22	6.25	6.28	6.32	6.35	6.38	6.42	6.45	6.48	6.52	6.55	6.59	7.02	7.06	7.10	7.14	7.17	7.19	38
39	6.00	6.03	6.06	6.10	6.13	6.16	6.20	6.23	6.26	6.29	6.33	6.36	6.40	6.43	6.47	6.50	6.54	6.57	7.01	7.05	7.08	7.12	7.16	7.20	7.22	39
40	6.00	6.03	6.07	6.10	6.13	6.17	6.20	6.24	6.27	6.31	6.34	6.38	6.41	6.45	6.48	6.52	6.56	7.00	7.03	7.07	7.11	7.15	7.19	7.23	7.25	40
41	6.00	6.03	6.07	6.10	6.14	6.17	6.21	6.25	6.28	6.32	6.35	6.39	6.43	6.46	6.50	6.54	6.58	7.02	7.06	7.10	7.14	7.18	7.22	7.27	7.29	41
42	6.00	6.04	6.07	6.11	6.14	6.18	6.22	6.25	6.29	6.33	6.37	6.40	6.44	6.48	6.52	6.56	7.00	7.04	7.08	7.12	7.17	7.21	7.25	7.30	7.32	42
43	6.00	6.04	6.07	6.11	6.15	6.19	6.22	6.26	6.30	6.34	6.38	6.42	6 46	6.50	6.54	6.58	7.02	7.06	7.11	7.15	7.19	7.24	7.28	7.33	7.36	43
44	6.00	6.04	6.08	6.12	6.15	6.19	6.23	6.27	6.31	6.35	6.39	6.43	6.47	6.52	6.56	7.00	7.04	7.09	7.13	7.18	7.22	7.27	7.31	7.36	7.39	44
45	6.00	6.04	6.08	6.12	6.16	6.20	6.24	6.28	6.32	6.36	6.41	6.45	6.49	6.53	6.58	7.02	7.07	7.11	7.16	7.21	7.25	7.30	7.35	7.40	7.43	45
46	6.00	6.04	6.08	6.12	6.17	6.21	6.25	6.29	6.33	6.38	6.42	6.46	6.51	6.55	7.00	7.04	7.09	7.14	7.19	7.24	7.29	7.34	7.39	7.44	7.47	46
47	6.00	6.04	6.09	6.13	6.17	6.22	6.26	6.30	6.35	6.39	6.43	6.48	6.53	6.57	7.02	7.07	7.12	7.17	7.22	7.27	7.32	7.37	7.43	7.48	7.51	47
48	6.00	6.04	6.09	6.13	6.18	6.22	6.27	6.31	6.36	6.41	6.45	6.50	6.55	6.59	7.04	7.09	7.14	7.19	7.25	7.30	7.35	7.41	7.47	7.53	7.56	48
49	6.00	6.05	6.09	6.14	6.18	6.23	6.28	6.32	6.37	6.42	6.47	6.52	6.57	7.02	7.07	7.12	7.17	7.22	7.28	7.33	7.39	7.45	7.51	7.57	8.00	49
50	6.00	6.05	6.10	6.14	6.19	6.24	6.29	6.34	6.39	6.44	6.49	6.54	6.59	7.04	7.09	7.14	7.20	7.25	7.31	7.37	7.43	7.49	7.55	8.02	8.05	50
51	6.00	6.0	9.10	6.15	6.20	6.25	6.30	6.35	6.40	6.45	6.50	6.56	7.01	7.06	7.12	7.17	7.23	7.29	7.35	7.41	7.47	7.53	8.00	8.06	8.10	51
52	6.00	6.05	6.10	6.15	6.21	6.26	6.31	6.36	6.41	6.47	6.52	6.58	7.03	7.09	7.14	7.20	7.26	7.32	7.38	7.45	7.51	7.58	8.05	8.12	8.16	52
53	6.00	6.05	6.11	6.16	6.22	6.27	6.32	6.38	6.43	6.49	6.54	7.00	7.06	7.11	7.17	7.23	7.29	7.36	7.42	7.49	7.56	8.43	8.10	8.17	8.21	53
54	6.00	6.06	6.11	6.17	6.22	6.28	6.33	6.39	6.45	6.50	6.56	7.02	7.08	7.14	7.20	7.27	7.33	7.40	7.46	7.53	8.00	8.08	8.15	8.23	8.27	54
55	6.00	6.06	6.11	6.17	6.23	6.29	6.35	6.40	6.46	6.52	6.58	7.04	7.11	7.17	7.23	7.30	7.37	7.44	7.51	7.58	8.05	8.13	8.21	8.29	8.33	55
56	6.00	6.06	6.12	6.18	6.24	6.30	6.36	6.42	6.48	6.54	7.00	7.07	7.13	7.20	7.27	7.34	7.41	7.48	7.55	8.03	8.10	8.19	8.27	8.36	8.40	56
57	6 0	6.06	6.12	6.19	6.25	6.31	6.37	6.44	6.50	6.56	7.03	7.10	7.16	7.23	7.30	7.38	7.45	7.52	8.00	8.08	8.16	8.25	8.34	8.43	8.48	57
58	6.00	6.06	6.13	6.19	6.26	6.32	6.39	6.45	6.52	6.58	7.06	7.13	7.20	7.27	7.34	7.42	7.49	7.57	8.05	8.14	8.22	8.32	8.41	8.51	8.56	58
59	6.00	6.07	6.13	6.20	6.27	6.33	6.40	6.47	6.54	7.01	7.08	7.16	7.23	7.30	7.38	7.46	7.54	8.03	8.11	8.20	8.29	8.39	8.49	9.00	9.05	59
60	6.00	6.07	9.14	6.21	6.28	6.35	6.42	6.49	6.56	7.03	7.11	7.19	7.26	7.34	7.42	7.51	7.59	8.08	8.17	8.26	8.36	8.47	8.58	9.09	9.16	60

TABLE XV.

To find the Time of the Sun's Riſing, Setting, and the Length of the Day and Night, by this Table.

Firſt. Find the ſun's declination at the top of the page (marked with the degrees of declination) and the latitudes in the right or left hand columns (marked lat.) and in the common angle of meeting is the time of ſun ſetting, if the ſun has north declination, but the time of ſun riſing, if the ſun has ſouth declination.

EXAMPLE I.

Let it be required to find the time of the ſun's riſing and ſetting, with the length of the day and night, in latitude 51° north, the 18th of July, 1796?

I firſt ſeek the ſun's declination for the given day, and find it 20° 53′ north, which I here call 21°, then under the declination 21, and againſt the latitude 51°, ſtands 7 H. 53 M. the time the ſun ſets on the given day, in lat. 51 north, which being doubled, gives 15 H. 46 M. the length of the day; and, if 7 H. 53 M. the time of the ſun ſetting, be ſubtracted from 12 H. the remainder 4 H. 7 M. gives the time of the ſun's riſing, which being doubled, gives 8 H. 14 M. length of the night.

But, when the ſun has 21° ſouth declination in this latitude, the time of ſun-ſetting becomes the time of ſun-riſing, and the length of the day will then become the length of the night.

Thus, the 25th of November, 1796, the ſun's declination will be 20° 59′ ſouth, or 21°, then the time of ſun-riſing is 7 H. 53 M. his ſetting 4 H. 7 M. and the length of the night 15 H. 46 M. and day 8 H. 14 M.

EXAMPLE II.

Let it be required to find the time of the ſun's riſing, ſetting, and length of the day and night, at Peterſburg, the 21ſt June, 1796.

Under 23° 28′ N. the declination that day, and againſt 60° N. the latitude of Peters-burg,	——	12 0
Stands the ſun's ſetting	——	9 16
The time of ſun-riſing	——	2 44
Sun-ſetting doubled is the length of day		18 32
Sun-riſing doubled is the length of night		5 28

EXAMPLE III.

Required the time of the ſun's riſing and ſetting, and length of day at the Cape of Good Hope, in lat. 34. 29 S. May 15th, 1796.

Under the declination 19° 6′ or 19° N. and againſt the lat. 34 S.	-	12 0
Stands the ſun's riſing	-	6 54
Time of ſun's ſetting	-	5 6
		2
The length of the day	-	10 12
And 6H. 54M. doub. is length of night		13 48

When a greater degree of accuracy is required, proportional parts may be taken for degrees and minutes of latitude and declination.

To find the Riſing and Setting of the Stars.

By this table the riſing and ſetting of any ſtar may be found, whoſe declination does not exceed 23° 30′ north or ſouth, in the following manner:

If you are in north lat. and the ſtar has north declination, look for the declination at the top, and the lat. in the right or left hand columns, in the angle of meeting, is half the time of the ſtar's continuance above the horizon, in that lat. or the time it takes in aſcending from the eaſtern ſide of the horizon to the meridian, and deſcending from the meridian to the weſtern part of the horizon.

Therefore, if theſe hours and minutes be ſubtracted from the time of the ſtar's coming to the meridian, the remainder will be the time of the ſtar's riſing, and if added, the ſum will be the time of the ſtar's ſetting.

EXAMPLE I.

Required when the ſtar Arcturus riſes and ſets December 1, in lat. 51 deg. N.

The time of the ſtar's coming to the meridian, or ſouthing in the morning		9 35
Then under ſtar's declination 20° 16′ or 20° N. and againſt lat. 51 ſtands		7 47
Time of ſtar's riſing in the morning	——	1 48
Added, gives the time of the ſtar's ſetting	——	17 22
		12
Star ſets 22 minutes after 5 in the evening	——	5 22

When the latitude is north, and the ſtar has ſouth declination, or the latitude ſouth and the ſtar has north declination, find the latitude in the ſide columns as before, againſt which, and under the degrees of declination, ſtands half the time

the ſtar is under the horizon, which being ſubtracted from 12, the remainder will be half the time the ſtar will be above the horizon in that latitude.

Example. What time will the Dog Star, Sirius, riſe and ſet at London, January 25?

		12 0
Under the declination 16° 26′ S. and againſt lat. 51° 32′ or 52° ſtands		7 26
Half the time the ſtar is above the horizon	— —	4 34
The ſtar comes to the meridian in the evening, at	—	10 05
Which ſubtracted, ſhews that the ſtar riſes at 31 m. after 5 in the evening		5 31
Added, ſhews the time the ſtar ſets in the morning	—	2 39

In like manner may the riſing and ſetting of the planets be found when their declination does not exceed 23°½, and the time of their paſſage over the meridian is known.

Suppoſe it were required to know the time of Jupiter's riſing and ſetting, in latitude 52 north, the 1ſt of Auguſt, 1796.

In the Nautical Almanack for 1796, I find that Jupiter paſſes over the meridian of Greenwich at 14 H. 3 M. that is, three minutes after two next morning, and his declination is 8° 27′ S.

Now, 12 H. added to 14 H. 3 M. is 26 H. 3 M. from which ſubtract 24 H. and the remainder 2 H. 3 M. is the time of his paſſing the meridian in the morning of that day, according to the civil account.

Under declination 8° 27′ or 8° and againſt latitude 52° ſtand 6 H. 41 M. half the time Jupiter is below the horizon; this doubled is 13 H. 22 M. the length of Jupiter's night, which ſubtracted from 24 H. gives 10 H. 38 M. the length of his day.

Again, 6 H. 41 M. added to his paſſing the meridian 2 H. 3 M. gives 8 H. 44 M. his riſing in the evening, and 2 H. 3 M. added to 12 H. gives 14 H. 3 M. from this ſum take 6 H. 41 M. and the remainder 7 H. 22 M. is the time of his ſetting in the morning.

Suppoſe it were required to find the moon's riſing and ſetting Auguſt 13th, 1796, in latitude 52° north.

In the Nautical Almanack, (page 6th) I find that the moon paſſes the meridian of Greenwich at 8 H. 16 M. in the evening, and her declination at midnight is 22° 55′ South.

Then in the tables, under the declination 21° 32′ S. or 22°, and againſt the lat. 52° ſtands 8 H. 5 M. Half the time ſhe is under the horizon doubled is 16 H. 10 M. the length of the lunar night, which ſubtracted from 24 H. leaves 7 H. 50 M. the lunar day. To the moon's ſouthing or paſſage over the meridian, 8 H. 16 M. add half the lunar day, 3 H. 35 M. gives 11 H. 51 M. her ſetting at midnight, and from 8 H. 16 M. take 3, 35, the remainder 4 H. 41 M. is the time of her riſing in the afternoon.

In like manner may be found the riſing and ſetting of the other planets, only obſerving that the noon of the common day, and end of the ſea day, is the beginning of the day in the Nautical Almanack.

As all the calculations here are made for the meridian of London, or Greenwich, care muſt be taken to reduce the time of their paſſages over the meridian of Greenwich to the meridian of the place of obſervation, by allowing 1 H. later for every 15° of weſt longitude, and 1 H. ſooner for every 15° of eaſt longitude.

It were to be wiſhed, that gentlemen belonging to the ſea would carry a celeſtial globe with them, upon which all the above may be found in an eaſy manner; for they would have nothing more to do but to ſet the globe north and ſouth, raiſe the pole as many degrees above the horizon as the latitude is; bring the ſun's place to the brazen meridian, and ſet the index to the upper 12; then turn the globe round, and note what ſtars come to the meridian, and the hour index will point to the time; when they come above the horizon, it will point to the time of their riſing, and when they deſcend below the horizon, it will point to their ſetting; for as each ſtar on the globe will point directly to one of the ſame name in the heavens, they may be viewed at any time of the night; or, if a planet, turn the globe until the index points to the time of their paſſage over the meridian, and make a mark on the globe with a pencil, under their declination, then turn the globe eaſt until the mark comes to the horizon, and the index will point to the time of their riſing; and turned weſterly till it come to the horizon, the index will point to the time of their ſetting.

But when there is no globe at hand, and you are doubtful whether you have obſerved by the right ſtar or not, as there may be ſeveral others near the Meridian at the ſame time, the following general rule will enable you to diſtinguiſh the ſtars, and by frequent obſervations be able to know any of the fixed ſtars ſet down in the table, and are eaſily diſtinguiſhed from a planet by their twinkling which a planet never does.

A general Rule for diſtinguiſhing the Stars.

1ſt. By the rules and directions following Table XIII. find the time of the ſtar's coming to the meridian.

2d. From the above table take the ſtar's declination, to which add the ſuppoſed latitude when the declination and latitude are of contrary names, that is, one North and the other South; but if both North or South, ſubtract the one from the other, and call this ſum or difference the complement of the ſtar's altitude; this complement ſubtracted from 90° gives the altitude. If this altitude correſponds nearly with that obſerved by your quadrant, it is certain you have taken the altitude of the right ſtar, otherwiſe not.

EXAMPLE.

Suppoſe that on the 25th of Jan. the meridian altitude of Sirius was obſerved at 10 o'clock at London, and found to be 22°. I want to know if I have taken that ſtar or not.

Sirius is found to ſouth, or be on the meridian that day at 10 at night.

Latitude of London — —	51°	32′N.
Sirius's Declination — —	16	26 S.
Comp. of Alt. — —	67	58
	90	00
Meridian Altitude — —	22	2

This altitude agreeing nearly with that obſerved, I conclude that I have taken the right ſtar. The ſame will hold good with any other ſtar.

Finis

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42

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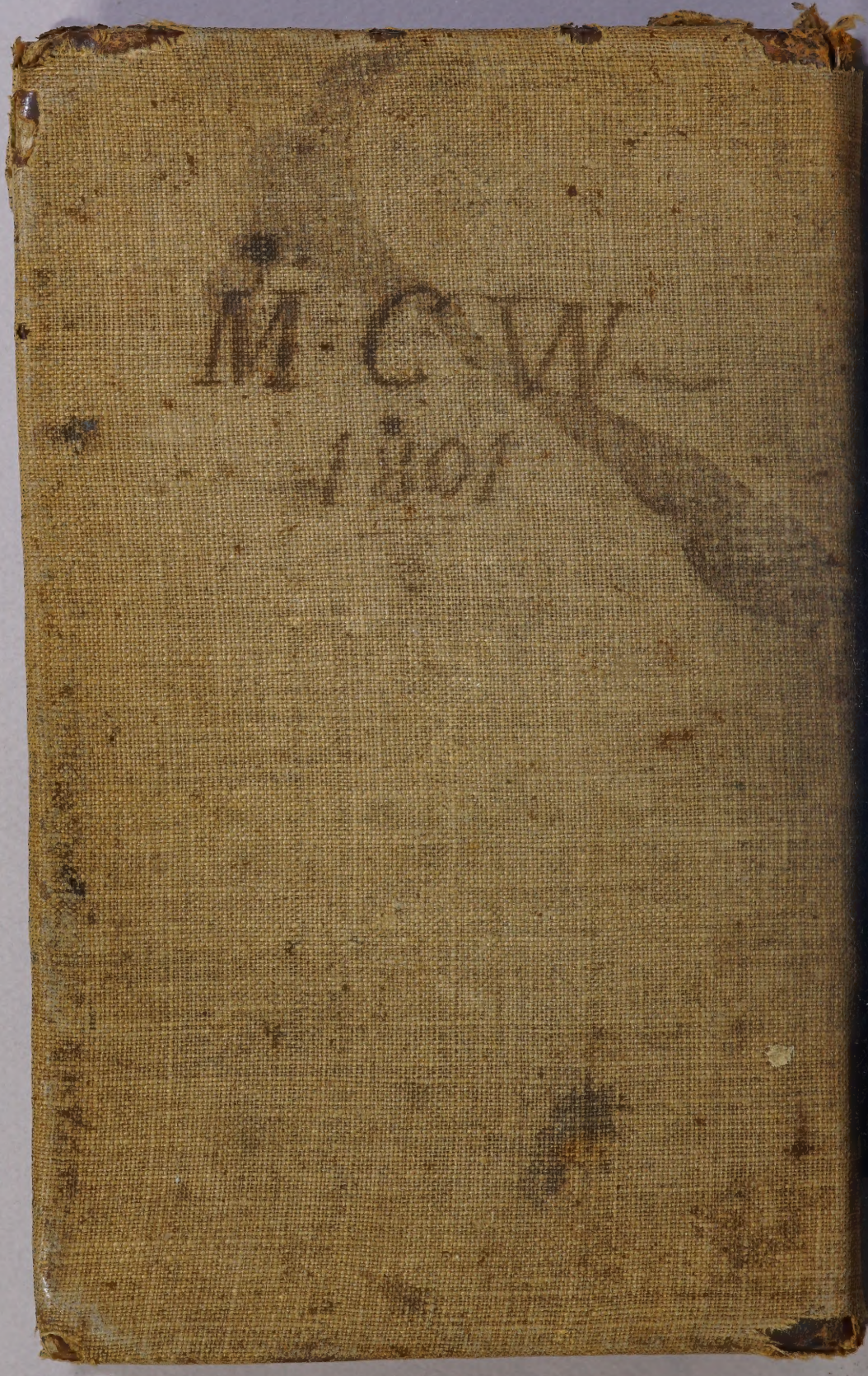
16
75 - 54

1/6
2/6
1/8 49

6/1 40 14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